The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. XXXV. July 25, 1936 No. 891

Heat Interchange

ONE of the most abstruse, yet important, sections of the Chemical Engineering Congress was that devoted to the consideration of heat interchange. This seems to be an instance in which the extreme virtuosity of the mathematicians has so far outstripped the pedestrianism of the experimentalists that it is becoming necessary for the hare to lie down awhile to wait for the tortoise, primarily so that the hare may discover whether he (or in the case of one of our most notable hares, she) is on the right path. In spite of the mass of work that has been done on the subject, the limitations of knowledge are still outstanding, so that a certain chemical engineer was constrained to remark that the best way of making heat transfer calculations is to set up a small-scale apparatus to obtain the necessary data experimentally. Unfortunately, this is not always possible, nor—as was shown in connection with the cognate subject of drying—are the small-scale results always an adequate guide.

The conception of a stationary film covering the surface of solids has for long been the basis of heat transmission work. Unfortunately, there is need for far more data than we now possess upon the resistance of the films set up by different substances and under varying conditions. Dr. Erk has shown that the effect of the heat conductivity of the material of the partition wall is generally insignificant in heat exchangers, a fact of no little importance when using non-corrosive materials such as plastics and glass. There are occasions , however, when the heat transfer between the walls and bounding liquids is very good and then the conductivity of the material becomes important. When heating a liquid there is another difficulty that the research workers do not yet appear to have begun to investigate, namely, that at some portion of the flow of the heating gases the liquid heated changes from a pure liquid into a mixture of liquid and vapour bubbles, intimate enough to be described by one speaker as an "emulsion."

The limitations of our knowledge are nowhere more apparent than in radiation. In Europe the work of Schack, published in 1924, has been accepted, but recent experiments by Schmidt (1932) have indicated that Schack's emission values for water vapour and CO_2 are much too low. Some preliminary measurements of the radiation from a blast furnace flame made by Lent and Thomas for a layer 4 ft. thick between 1,000 and 2,400° F. gave a mean curve of radiation roughly parallel to Schack's curves but considerably above it, the deviation varying from about 100 per cent. at the lower temperature to 25 per cent. at the higher temperatures. The importance of this subject is evident from the fact that in high temperature gas-heated furnaces some 90 per cent. or more of the heat is transmitted by radiation.

Another important recent discovery has been the demonstration of the incorrectness of the previous view that certain surfaces such as alumina, silica and white paint which exhibit visual whiteness, but are approximately 90 per cent. black bodies at room temperatures, will retain their high emissivity throughout the industrially important range of temperatures encountered. Heilman's results indicate that there is a continual decrease of emissivity from about 0.9 at 0° F. to 200° F., down to about 0.55 at 1,400° F.; on the other hand black paint and a dark refractory such as chrome brick retain their high emissivity as the temperature increases.

An important practical discovery published in 1930 and 1931 is that in condensation of vapours abnormally rapid heat transfer occurs when the condensate fails to wet the cooling surface and collects in drops. Nagel and his co-workers published a series of papers in 1933-35 in which they show that clean steam, whether or not it contains non-condensible gas, always condenses in a film on clean surfaces, rough or smooth and that for drop-wise condensation to occur the surface must be contaminated. Numerous substances will make the surface non-wettable, but obviously only those that are firmly held, for example, by adsorption will serve as drop-promoters in a condenser. Some promoters seem to depend for their efficiency on the amount of non-condensible gas present, and while some contaminants, such as mercaptans on copper alloys, are specifically effective on certain metals, others, such as fatty acids, are quite generally applicable; dropwise condensation is more easily induced and maintained on smooth surfaces than on rough. In a steam condenser, for example, there may be a seven- to ten-fold increase in the steam-side coefficient accompanying a change from film to drop-wise condensation, and since the steam-and water-side coefficients are of the same order of magnitude this has as much overall effect as would a corresponding change on the waterside, whereas a like change on the water side would require impracticably high water velocities. It is, therefore, not surprising to find an increase in 60 per cent. in the overall coefficient with drop-wise condensation, even with dirty tubes. Thus the capacity of the condenser may be increased, the quantity of cooling water decreased, or the absolute pressure in the condenser decreased, and the result is equivalent to a considerable saving in fuel. Similar advantages can accrue in evaporators, particularly those using forced circulation.

Notes and Comments

Chemical Plant Exhibition

INQUIRIES among the firms which participated in the British chemical plant exhibition reveal that general satisfaction is felt with the results of the exhibition. Of particular note was the large number of visitors, both British and foreign, connected with the chemical and allied industries, merely curious visitors of no potential buying power being few. Though orders are rarely placed on sight in an exhibition of chemical plant, yet quite a number of orders were booked, particularly for the smaller apparatus, and inquiries for commercial machines were not only numerous, but in many cases covered new fields. Many useful contacts were made which are expected to yield positive results, and some firms record that many of these contacts were of a type not usually met with at trade exhibitions. It is difficult to indicate what types of plant were most in demand, but general interest was shown in the different materials which are resistant to corrosion, heat and abrasion, and the foreign visitors showed special interest in stainless steels. Similarly, no indication can be given to show which industries were most interested by the exhibition, as inquiries came from all the industries which would normally be interested in the wide range of plant and materials which was on view.

Exports Down ; Imports Up

DESPITE an increase for the month of June, the value of chemicals, drugs, dyes and colours exported from Great Britain during the first half of this year showed a total decrease of £242,363 compared with the first six months of 1935, while imports for the same period were £702,348 higher than in the first half of 1935. Whereas in the period from January to June, 1935, the balance of trade was £10,515,402 to £5,319,166 (exports exceeding imports by £5,196,236), the figures just issued for the first half of 1936 show the margin to have been reduced to £10,273,039 to £6,024,514 (a difference of only £4,248,525). Notwithstanding the aggregate decrease, exports of coal-tar products, proprietary medicines, dyes and dyestuffs, paints and enamels all showed a steady rise, but sulphate of ammonia dropped from £791,851 to £647,653, copper sulphate from £369,738 to £262,663 and drugs from £104,324 to £69,023. Increased prosperity in the textile industry at home is indicated by the fact that imports of dyestuffs for the half year rose from £536,929 to £792,497. The Soviet Union more than doubled its purchases of chemical products from Great Britain, while Great Britain almost halved its imports from the Union. Exports to Italy during the half year were only £2,121 against £129,404, while imports from Italy were correspondingly reduced from £125,269 to £1,510.

The Gas Mask Propaganda

MEMBERS of the British Medical Association, at their annual meeting at Oxford last week, condemned the use of poison gases in warfare, but lacked the courage to pass a resolution that gas should be proclaimed illegal. Their own experience, in a profession which is primarily devoted to the alleviation of pain; tells them that chemical warfare will cause untold suffering and impairment of health—physically and mentally—together with great destruction of life, and they are sanely of the opinion that any measures for protecting the general public against the ill-effects of poison gas can only be very imperfect and inadequate. One particular group of medical men, the Socialist Medical Association, however, have done a still more important service by publishing a booklet in which they give unchallengeable facts to show that the effects of gas in an aerial attack by enemy aircraft will be far more destructive to life and cause much more serious injury than we are led to anticipate by literature from official sources and by the manner in which " gas mask propaganda " has been served up to the general public by some of the newspapers. The general public has little or no knowledge of the nature of the corrosive chemicals which could be used in warfare; many national daily newspapers, with that gross ignorance of scientific matters so wisely commented upon in a leader which appeared in a recognised journal of high academic standard—" Nature," July 18, 1936—have only been able to use the information which has been placed before them, and with help from official sources they give the false impression that a poison gas attack by air will certainly be serious, but not nearly so serious as many people anticipate.

Practice versus Theory

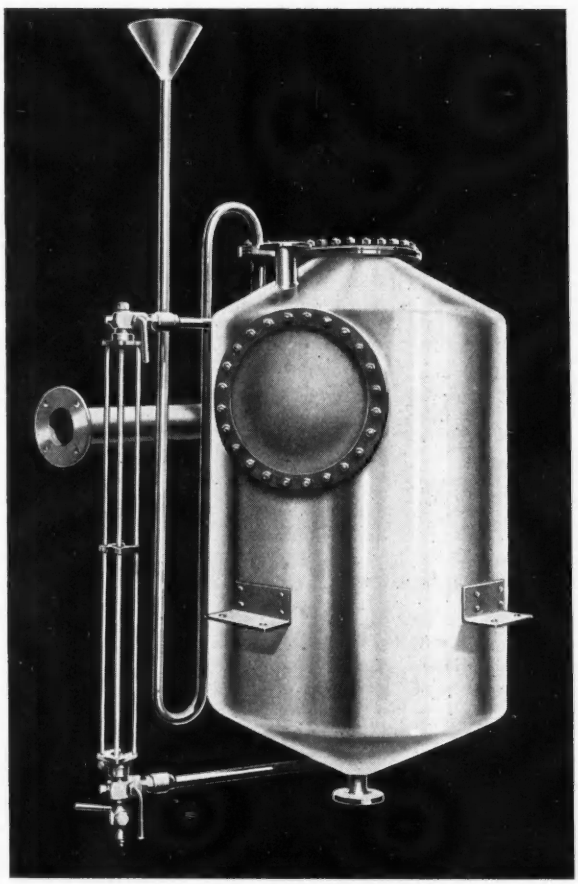
THE Government, however, is wisely making provision to supply gas masks for the use of the general public should war break out. It is merely a precaution against risks; they have not yet issued the " fixture card " stating who we shall play against or when the contest will take place! We, for our part, have the assurance that gas masks will be provided and they will be 100 per cent. efficient against all gases and vapours which can ever be used in warfare. The gas mask container is filled with charcoal, we are told, together with " some filters that represent a secret process of manufacture." Charcoal, of course, is good; on the nature of the " filters " we have been given no precise information. Anyone who can make such a statement—scientist, Government official or secret service agent included—is truly a wizard with the most prophetic power of seeing into the future. The maker of poison gases also has a " secret process," in his case a process for devising a gas which will penetrate any gas masks which are likely to be in use. The public knows nothing of the way in which the scientific mind works on the development of these secret processes and so in blissful ignorance it accepts the wording of any literature which is laid in front of it—provided it has credentials to show official or national daily newspaper origin. One day, if ever the great civilisation-destroying experiment is carried out, some of those who survive will know that all theory does not work in practice. It is now, at this present moment, that those who have good chemical knowledge may do a useful public service by exposing the whole truth about poison gases and by demanding adequate proof of the efficiency of the masks which we may be forced to wear for 24 hours per day.

Fine Chemical Processing Equipment

Constructional Uses for Nickel and Monel Metal

THE high purity which we are accustomed to associate with fine chemicals and pharmaceutical products generally, could not have been achieved without a close consideration of the materials available for the fabrication of machinery parts used in the manufacture of such products.

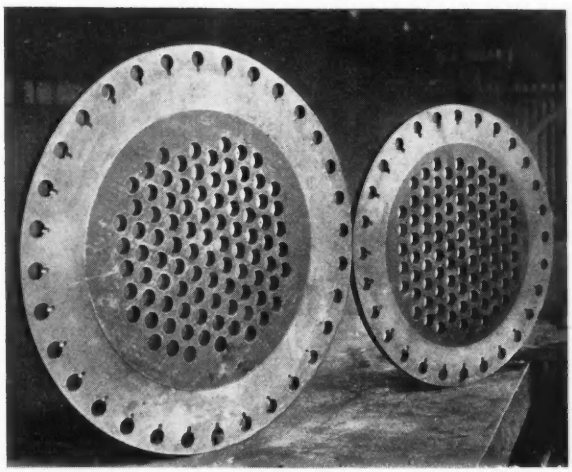
There are a number of problems encountered in the manufacture of fine chemical which involve a combination of variables, it being necessary to treat each case individually



Monel metal still made by G. Hopkins and Sons, Ltd., (Clerkenwell), for use in the manufacture of aspirin tablets at the Ilford works of Howards and Sons, Ltd.

and in co-operation with the metallurgist. Purity of the product must be ensured and the problem of corrosion must be faced. The latter is closely linked with the question of economic production, because if the machinery depreciates rapidly the cost of the product is high. To keep this cost at a reasonable level the metals used should be capable of easy fabrication, and readily available in various forms.

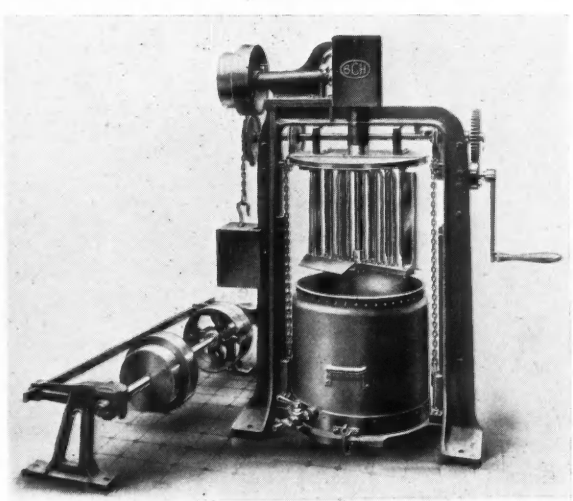
The use of either nicked or Monel metal is advocated in a number of fine chemical manufacturing problems for which experience has shown them to be specially suited. Both these metals are particularly suitable for pure products because they are bright metals, easily kept clean; and also because a wide range of chemicals can be handled in them without contamination. They are, of course, high resistant to corrosion, many acids and all alkalies leaving these metals unaffected. They are "engineering" metals, capable of withstanding hard service and of retaining their strength at elevated temperatures.



These tube plates in pure nickel were built by John Thompson (Dudley), Ltd., for use in a caustic soda evaporator erected by W. J. Fraser and Co., Ltd., for the Castner Kellner Alkali Co., Ltd., at Runcorn. The larger plate is 3 ft. 3½ in. diameter by 1¼ in. finished thickness, and the smaller plate is 2 ft. 9½ in. diameter by 1⅛ in. finished thickness.

Nickel, and also Monel metal, can be readily welded to give a completely resistant joint. Hot caustic soda solutions are commonly handled in pure nickel. Where a variety of products is commonly handled by mechanical mixers, corrosion-resisting shafts and propellers of Monel metal are frequently employed.

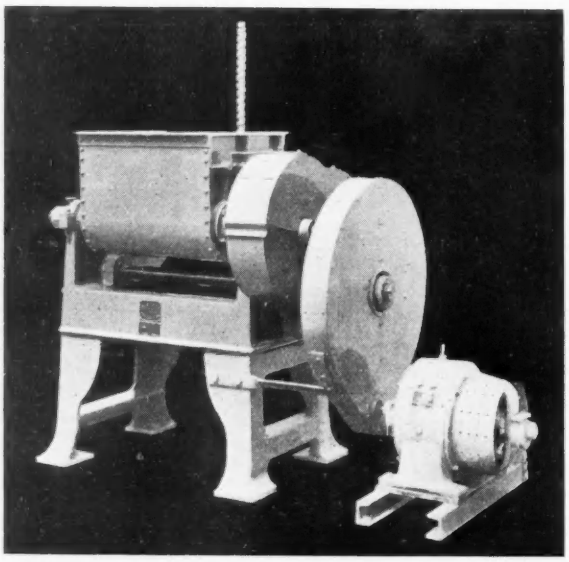
The purity and whiteness of effervescent salts are preserved by at least one manufacturer by the use of a granulator in which the rotor, lining and screen are all of Monel metal.



Pure nickel pan and stirrers, water jacketed, 20 gallons capacity, as used in the manufacture of face creams (Brierley, Collier and Hartley, Ltd.)

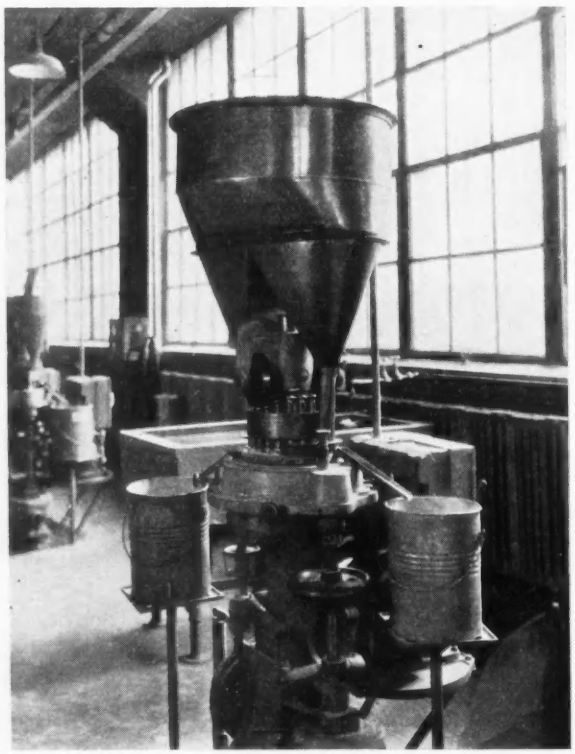
In similar types of equipment Monel metal has replaced equipment constructed of ferrous metals which lead to discolouration by iron oxide of the products handled. In the preparation of *Bacillus acidophilus* blocks the whirling bowls

which are subjected to extreme stresses are made of machined Monel metal forgings, not only because of the alloy's high



Mixer for toothpaste manufacture, constructed in Monel metal by Baker Perkins, Ltd.

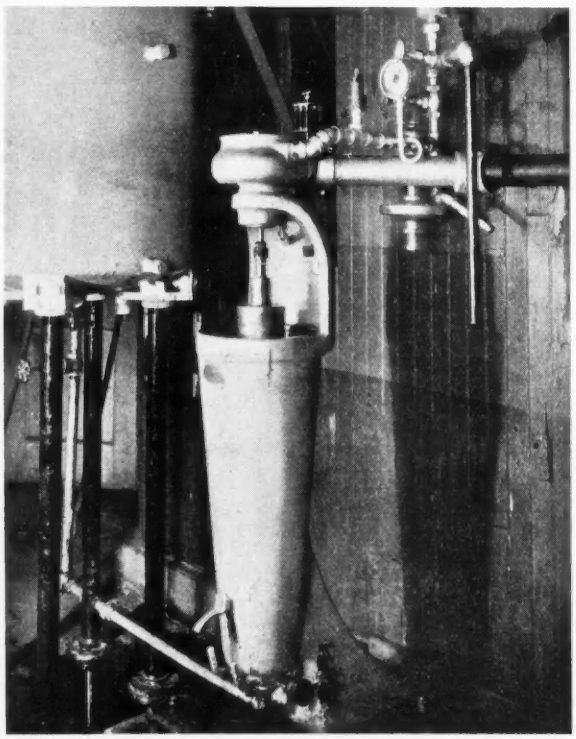
strength, but because of the high-corrosion-resistance necessary in this and similar applications such as the manufacture of salicylates.



Tablet compressing machine in the plant of a large pharmaceutical manufacturing company. All the hopper parts and working parts of the machine are in Monel metal to resist the corrosive action of the various chemical media involved.

In the storage of essential oils and aromatic chemicals the colour and odour must be carefully protected, and tests and experience have shown that these expensive materials may be safely stored in Monel metal containers. Some of the materials at present stored in containers of this nature may be mentioned. They include oil cedar wood, oil sassafras, oil anise, oil spruce, oil lemon grass, oil origanum, methyl salicylate, safrol, oil cedar leaf, oil peppermint, oil citronella and oil spike lavender.

Monel metal storage tanks are also used, in preference to non-metallic containers, for many proprietary medicines, especially those with a cod liver oil base, the stability of which must be carefully maintained. The metal's durability,



Centrifuge equipped with Monel metal bowl, as supplied by Sharples Super-Centrifuge Manufacturers.

resistance to shock, and the ease with which it may be kept clean are important factors in these applications.

The distillation of hexylresorcinol is carried out in stills made entirely of nickel because in addition to its hygienic properties it has durability and is fabricated readily into the necessary intricate shapes and bends of the plant required for this process. Tubes, sheet, cast valves, ground and joint unions, elbows and other fittings are also available in nickel. Monel metal or nickel are also widely used in the manufacture of face creams, for filling machines and for strainers. In one pharmaceutical works light gauge Monel metal strainers, installed in 1911, have remained entirely unaffected by the strong alkali preparation which is handled by this particular machinery.

Its combination of many valuable qualities—freedom from rust, resistance to corrosion, light weight, and high thermal conductivity in particular—have given aluminium a great variety of uses in the food, chemical and allied industries. These include condensers, stills, heating and cooking coils, candle moulds and miscellaneous ducting. In nitric acid manufacture, aluminium tubing is used for cooling coils, pressure piping and fume piping. This gives point to a new booklet, "Aluminium Tubes and Pipes," issued by the British Aluminium Co., Ltd., in which the common sizes of this form of the metal are set out with weights, calculated in pure aluminium, which do not greatly differ from weights of the aluminium alloys in which tubes are drawn for specially strenuous service.

Technique of the Hydrogenation of Coal

Discoveries at the Fuel Research Station

THE term " hydrogenation " in its strictly chemical sense refers only to the addition of hydrogen by chemical combination to an unsaturated substance, said Dr. J. G. King, of the Fuel Research Station, in a paper read at an annual meeting of the Institute of Fuel. In fuel technology, however, it has now come to have a wider meaning, owing to the advances which have been made in the production of oils from coal, and oils of low boiling-point from high-boiling oils by the action of hydrogen under pressure. Since hydrogen is used and takes part in the reactions, the whole process has been losely termed " hydrogenation," although it would be more strictly correct to use the term " hydrogenation-cracking."

Chemical Reactions

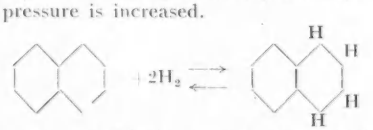
The action of the hydrogen involves a number of types of chemical reaction :—(a) Hydrogen may add on to unsaturated compounds (true hydrogenation) : (b) oxygen, nitrogen, and sulphur in the raw material may be eliminated as water, ammonia and hydrogen sulphide, by combination with hydrogen ; (c) aromatic hydrocarbons may become hydrogenated to naphthenes, which decompose to simpler hydrocarbons ; (d) complex molecules may decompose or crack, under the influence of the high temperature employed, to produce unsaturated molecular fragments which are stabilised by hydrogenation. The over-all effect of the reactions is that the ratio of hydrogen to carbon in the product is greater than in the raw material. Since the main object of hydrongenation thus defined is the reduction of boiling-point, and therefore of molecular weight, it follows that the cracking reactions are quite as important as those of hydrogenation.

The cracking or breakdown of complex molecules must, however, be accompanied by immediate hydrogenation of the unsaturated fragments, if undesirable secondary reactions are to be prevented. The process consists essentially, therefore, in the balancing of two diverse types of reaction in order to obtain the best results, and the technique necessary for the development of the process has been built up on a study of the influence of the variable factors upon these reactions. The most important variables are temperature, pressure, and the rate of combination of hydrogen. Since the latter is influenced greatly by the presence of catalysts, it is now understood that these are essential in modern technique. Catalysis of the cracking reactions is not normally attempted, but it is possible that certain of the hydrogenating catalysts use also catalyse the cracking reactions. It is generally understood, however, that the important factor in accelerating cracking reactions is temperature.

Effect of Variables

The effect of the variables in relation to coal and low-temperature tar has generally been considered empirically by experiment upon these substances, but has been helped by a study of chemical substances similar in character to those present in the products of coal. The technique adopted in the finished process depends upon a proper understanding of the behaviour and individual requirements of the separate constituents of the raw material, and on the best manner in which a compromise can be effected between the requirements of the variables. In considering these variables in this paper, it is understood that the treatment of coal involves an initial liquid-phase treatment followed by vapour-phase treatment of the oil produced. Coal tars generally require similar treatment, but low-temperature tar and tar distillates may be treated in the vapour-phase.

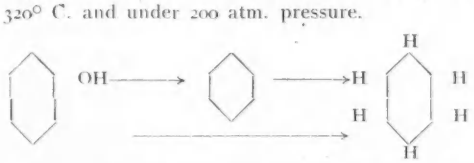
Increase of pressure must favour the hydrogenation reactions, since increase of concentration of hydrogen must, by the Law of Mass Action, increase the rate of reaction, and also since hydrogen is absorbed. This is readily illustrated by reference to a typical constituent of tar—naphthalene ; in the hydrogenation of this hydrocarbon to tetrahydro-naphthalene the equilibrium moves to the right at a given temperature if the pressure is increased.



In the presence of hydrogen at atmospheric pressure, naphthalene is stable up to a relatively high temperature, but at a high pressure in the presence of a suitable catalyst it is converted quantitatively to tetrahydro-naphthalene at 400° C. This is a desirable result, since conversion of naphthalene to tetralin is a necessary preliminary to its conversion to the low-boiling derivatives of benzene.

Conversion of Phenol

Phenol, stable to temperatures above 450° C., at atmospheric pressure, is similarly converted to benzene and cyclo-hexane from 320° C. and under 200 atm. pressure.



Conditions which aim at the maximum hydrogenation of naphthalene will also tend to increase the yield of cyclohexane from phenol at the expense of benzene, a reaction which is not desired. Examination of other pure substances indicates that it is not possible to find conditions which give the best results in each case, so that the technique of hydrogenation of complex raw materials must consist largely in effecting a compromise between the conditions required for the optimum treatment of their constituents.

Increase of pressure may be expected, therefore, to assist in the treatment of coal and coal tar by helping the hydrogenation reactions and thereby increasing throughput by allowing the process to be carried out at a higher temperature. The liquid-phase treatment of coal and the vapour-phase treatment of low-temperature tar may be used to illustrate this point, the first having as its object a high yield of oil and the second a high yield of low-boiling oil or spirit.

Treatment of Low Temperature Tar

The effect of pressure in the treatment of low-temperature tar has been determined in a continuous system of keeping the throughput of tar and hydrogen proportional to the pressure, so that the time of contact of the raw materials and the catalyst remain the same. The rate was 0.5 ml. of tar per ml. of catalyst per hour per 100 atm. pressure. The effect of pressure was measured by observing the proportion of spirit (below 200° C.) produced. At a reaction temperature of 480° C. the yields were :

Pressure atm. ...	100	150	200	300	400
Spirit wt. % ...	35.4	36.3	41.0	41.8	42.2

Below 400° C., where cracking is slight, the effect of increase of pressure above 100 atm. is small, while above 400° C. the degree of conversion to spirit increases steadily to 300 atm., above which it appears to have little effect.

Increase of pressure from 200 to 400 atm. has little effect on spirit yield, a decrease below 200 atm. causes a rapid falling off. This is apparently due to the decreasing rate of hydrogenation allowing the cracking reactions to proceed too rapidly and to form an undue proportion of permanent gas. The optimum pressure therefore for a temperature of 480° C.

appears to be 200 atm. At a higher temperature the optimum pressure will also be higher. For example, at 510° C. it is 400 atm.

An important effect of pressure is that it reduces the rate of deterioration of a vapour-phase catalyst. This effect is not necessarily associated with the raw material, but may be due to the greater degree of hydrogenation of substances of high molecular weight, which if unchanged would cloak the catalyst. It may also be due to the more rapid rate of hydrogenation of the unsaturated bodies formed by cracking, polymerisation or excessive cracking being thereby prevented. This effect of pressure is most important in the vapour-phase process, since it increases the useful life of the catalyst and maintains its activity. Comparative rates of deterioration at 200 and 400 atm. respectively with low-temperature tar are 0.3 and 0.1 per cent. decrease in the spirit yield per 24 hours. With certain distillates of tar the rate of deterioration approaches zero below 400 atm. and it is possible that with low-temperature tar the rate may become zero at slightly higher pressures.

Effect of Temperature

The general effect of increase of temperature is that the rates of both hydrogenation and cracking reactions are accelerated. Increase of temperature, however, decreases the maximum degree of hydrogenation possible so that temperature has a two-fold effect. At a low temperature (about 400°C.) the less degree of hydrogenation is not marked since the reactions do not proceed to completion in the time allowed and increase of rate has a counterbalancing effect. At a high temperature, however, the effect is considerable and fully hydrogenated substances of high molecular weight are unstable.

The effect may be illustrated by reference to the behaviour of pure substances. In the case of tetralin, cracking at 200 atm. pressure causes dehydrogenation above 400° C. and almost complete decomposition to benzene and its homelogues at 500° C.

Temperature ° C.	400	450	500
Tetralin decomp. %	3	30	90

Similarly phenol is stable at 300° C. in hydrogen at 200 atm., whilt at 400° C. it is converted to benzene and cyclo-hexane at three times the rate obtaining at 350° C.

Temperature ° C. ...	300	350	400	500
Phenol converted % ...	0	24	78	100

These examples show that the effect of change of temperature on complex raw materials will vary with the temperature used. As this rises the fully hydrogenated products first formed will give place to a mixture of the hydrogenated products of cracking. With these complex materials only the overall effect can be considered since the working temperature cannot be chosen to suit all the components. There will, however, be a range of temperature which will give the best compromise between hydrogenation and cracking. In considering this compromise, it should be remembered that it is not desirable in the production of motor spirit from coal or tar to produce fully hydrogenated products, since this would involve the greater consumption of hydrogen and the production of oils of too high boiling-point.

Complex Compounds

The effect of temperature in the treatment of low-temperature tar should be considered from the start of the reaction at 200 atm. pressure. Reaction begins at about 300°C., at which temperature cracking is negligible. Complex compounds which appear as pitch on distillation are the first to react. These absorb hydrogen readily and are rapidly converted to oils soluble in petroleum ether (b.p. 40° to 60° C.). As the temperature increases the rate of the cracking reactions accelerate and the yield of low-boiling oils increases until a point is reached when cracking becomes so severe that too high a propottion of permanent gas is formed.

Curves obtained in the hydrogenation of low-temperature tar with a MoS_2 catalyst at the Fuel Research Station (the temperature range covered being 300° to 510°C.) show that the proportion of low-boiling constituents increases linearly with increasing temperature up to about 480° C. This is true at pressures of both 200 and 400 atm. and for widely different rates of throughput of 0.25 to 4.0 ml. of tar per ml. of catalyst space per hour. At temperatures above 500° C., the rate of hydrogenation at 200 atm. is insufficient to keep pace with the rate of cracking, and the yield of gas tends to increase at the expense of the spirit yield; at 400 atm. the greater rate of hydrogenation can keep pace with the rate of cracking to a higher temperature and a greater yield of spirit results.

The effect of pressure in reducing cracking to permanent gas is noticeable at 510° C., the difference in yield of spirit being as high as 10 per cent. The changes in the appearance of the product are characteristic. At 370° C. tar has lost its almost black appearance and is brown. At 400° C. the colour changes to dark orange and the oil becomes transparent. At 420° C. the colour lightens to orange and at 450° C. to lemon. At the normal reaction temperature of 480° C. the crude product as it runs from the plant is pale yellow and transparent. The colour, however, rapidly darkens on standing. There is little change up to 350° C. but between 350° C. and 390° C. reaction becomes marked and at about 440° C. with an active catalyst there is complete reduction to aromatic hydrocarbons.

Effect of Catalysts

There is no reason why, in the presence of a good hydrogenating catalyst, a cracking catalyst should not also be used, and the best conditions can be visualised as those in which catalysts of each type are operating together.

The use of a catalyst in the treatment of oils is a different matter to the effect of a catalyst in the hydrogenation of coal. In this case the catalyst need not be added to the raw material but may be used in a solid porous form, the vapour of the reactants with hydrogen passing through it. Since fresh catalyst is not continuously added to the system it follows that one must be chosen which retains its activity for a reasonable length of time and is capable of re-activation. In experiments at the Fuel Research Station, the catalyst used has been a supported one, *i.e.*, the catalytic substance has been deposited upon a porous or granular support. If the same catalytic substance be used in a pelleted form, the volume activity of the catalyst is about the same, but its weight is only about one quarter.

Ratio of Hydrogen to Raw Material

The effect of this ratio can best be illustrated by reference to vapour-phase treatment, since in liquid-phase treatment it is sufficient to have an excess of hydrogen passing through the system which maintains the concentration of hydrogen above 80 per cent. In the treatment of low-temperature tar it is found that the yield of low-boiling oils is sensitive to the molecular ratio of hydrogen to tar up to a ratio of 30 : 1 taking the molecular weight of tar as 250). Above the ratio of 30 : 1 an increase has very little effect. The optimum ratio is increased with increasing temperature; the following results were obtained at 480° C. :—

Effect of Hydrogen/Tar Ratio.

Hydrogen/Tar, mol. Ratio ..	13	22	37	52	97
Sp. gr. of product	0.867	0.854	0.847	0.848	0.847
Spirit, per cent., to 200°C. ..	40.5	44.2	44.5	45.8	45.2

Provided a sufficient time of contact is given for conversion to spirit, small changes in either direction have relatively little effect. For coal a time of contact of about two hours is desirable in the liquid phase if the percentage of residual solids is to be low. An increase of this time to three hours increases the yield of spirit from 37 per cent. to 42 per cent. by weight of the coal and reduces the yield of heavy oil. In the vapour phase the time of contact is very much less and a relatively larger change of time has only a small effect.

A knowledge of the combined effects of the above variables provides much of the data necessary to determine the technique or compromise to be adopted on a manufacturing scale.

The compromise will be the result of the following general considerations in relation to the raw material to be dealt with.

The pressure will be as high as the engineering difficulties and costs will allow since a higher pressure favours the hydrogenation reactions, giving, up to about 350 atm., a high yield of low-boiling oils. In addition, it allows a higher working temperature to be used with a vapour-phase catalyst, or alternatively decreases the rate of deterioration of the catalyst at the same temperature. The pressure now used for coal is 200 to 250 atm., but it is probable that this will be increased.

Temperature Limits

The temperature will be sufficiently high that the cracking reactions may proceed at such a rate that the hydrogenation reactions are controlled to give not too high a yield of fully saturated or hydro-aromatic products. The upper limit of temperature is also controlled by the necessity for avoiding the production of too high a proportion of permanent gas. The temperature chosen must also depend upon the treatment. In the liquid-phase treatment of coal, where the object is a high yield of oil, the temperature should be as low as is compatible with high throughput, whereas in the vapour-phase consideration of the life of the catalyst imposes an upper limit unless the pressure can also be raised. The temperatures now used for the treatment of coal vary from 440° C. to 480° C. and for the vapour-phase treatment of distillates and low-temperature tar from 480° to 520° C.

The proportion of hydrogen to raw material will depend mainly upon the necessity for keeping up the partial pressure of the hydrogen in contact with the products. In the case of coal the concentration of the hydrogen should not fall below 80 per cent. in the spent gases and the amount necessary is about 24,000 cu. ft. per ton of coal. In the vapour-phase the retaining of the optimum molecular ratio of about 30 : 1 will mean the supply of about 500 cu. ft. of hydrogen per gal. of low-temperature tar.

The choice of coal for the process is important. The most generally suitable coals are those having a carbon content of from 80 per cent. to 85 per cent. The yield of spirit increases with the carbon content, but so does the difficulty of treatment. In practice, therefore, there should be a tendency to deal with coals towards the higher limit of carbon content.

The most suitable catalysts for the liquid-phase conversion of coal are the organic compounds of tin. The catalyst is added to the coal and the latter pasted with heavy oil to make a pumpable mixture. The mixture is made acid since it has been shown that hydrogenation proceeds more rapidly under acidic conditions. An awkward part of the liquid-phase process is the disposal of the heavy sludge containing unconverted carbon and coal ash. Valves of specially hard material are necessary to allow of its removal from the converter, and, secondly, a special process of distillation is necessary to recover heavy oil and produce a low-grade smokeless fuel.

The conversion of coal to motor spirit involves several stages of treatment :—(1) Liquid-phase treatment of the coal; (2) removal of sludge and ash; (3) fractional condensation of the distillate to motor spirit, oil and heavy oil; (4) liquid-phase treatment of the oil and its separation into spirit and middle oil; and (5) vapour-phase treatment of the middle oil, the condensation of the motor spirit formed and the recycling of the middle oil. The treatment of low-temperature tar and its distillates is less complex and embraces the vapour-phase half of the process only.

Extension of Other Raw Materials

The technique of hydrogenation cracking will certainly be extended to deal with substances other than coal, coal tar or its distillates. Research has already shown that rubber, resins and similar natural products can be readily treated to give motor spirit and lubricating oil. The introduction of the liquid-phase treatment prior to the vapour-phase treatment will also bring high-temperature tars into the picture. Although hydrogenation cracking as described above does not produce lubricating oils from coal or coal tar, it seems certain that a combination of the process with cracking and polymerisation will eventually yield lubricating oils from materials of coal origin. In addition, the technique can be used for the refining of materials containing sulphur or unsaturated hydrocarbons. Crude benzole, for example, can be refinted with a loss of raw material of less than one per cent. The sulphur compounds in lubricating oils can be reduced practically to zero.

(*To be continued.*)

Japanese Chemical Industry

Increased Overseas Trade in 1935

TOTAL exports of drugs, chemicals, medicines and explosives from Japan in 1935 were valued at 61,133,403 yen*, compared with 52,460,068 yen in 1934. Increases occurred principally in the definite chemical group, the following being some of the more important items exported in 1935 compared with the exports for 1934 shown in parentheses :

Acetic acid 886,221 yen (598,260); sulphuric acid 320,703 yen (421,684); nitric acid 511,656 yen (625,878); arsenic acid 304,214 yen (354,256); arsenate of lead 418,093 yen (189,250); sulphide of soda 416,960 yen (590,074); silicate of soda 329,805 yen (231,674); caustic soda 2,684,589 yen (2,025,063); soda ash 2,258,353 yen (1,194,325); chlorate of potash 1,162,450 yen (892,042); sulphate of ammonium 659,554 yen (134,431); bleaching powder 1,106,990 yen (755,156); calcium carbide 1,597,904 yen (1,378,397). The destinations of these chemicals are exceedingly diverse, and for most items new buyers are being found each year. Principal buyers are : Acetic Acid.—China, Germany, Dutch East Indies, Egypt. Sulphuric Acid.—Kwantung Province, China, Straits Settlements, Philippine Islands, Dutch East Indies. Nitric Acid.—China, Kwantung Province, Hongkong, Siam, Dutch East Indies, Philippine Islands. Arsenic Acid.—United States, Great Britain, Hawaii, Australia, Brazil. Arsenate of Lead.—Dutch East Indies, Kwantung Province, United States. Sulphate of Soda.—China, Kwantung Province, India. Caustic Soda.—China, Dutch East Indies, India, Argentina, Mozambique (Africa). Soda Ash.—India, China, Kwantung Province, Argentina. Silicate of soda. Dutch East Indies, Kwantung Province, Hongkong, India. Chlorate of potash.—China, India, Manchukuo, Siam, Australia. Sulphate of Ammonium.—French Indo-China, Philippine Islands. Hongkong, India. Bleaching Powder.—China, India, Manchukuo, Hongkong. Calcium carbide—Kwantung Province, China, India, Straits Settlements, Dutch East Indies, Philippine Islands.

Imports of chemicals are included under drugs, chemicals, medicines, and explosives, the total of which were valued at 157,314,423 yen in 1935, and 144,293,432 yen in 1934. Chemicals made up more than half this total. Boric acid imports are relatively small, amounting to only 297 short tons (106,874 yen) in 1935 and 167 tons (75,300 yen) in 1934. They originated in Germany, Great Britain and the United States. This acid is used principally in the glass industry,

* Yen = Approximately 2s. at current rate of exchange.

and the domestic industry supplies the greater part of the demand. According to the trade returns, imports of tartaric acid amounted to 379,667 lb. (247,409 yen) in 1935 as against 443,057 lb. (305,002 yen) in 1934. Germany, Italy and Spain were the principal shipping countries. Japan is dependent on outside sources for this product.

Salicylic acid imports amounted to 82,606 lb. (72,573 yen) in 1935 as against 389,836 lb. (253,335 yen) in 1934. The two sources of supply are Germany and the United States. Principal uses are as preservative and in the manufacture of "sake," a Japanese wine. Acetyl-salicylic acid imports have been decreasing rapidly, and in 1935 totalled only 9,099 lb. (57,444 yen). They came principally from Germany and France.

Increased Carbolic Acid Production

As Japanese production of carbolic acid has increased, imports have fallen off. In 1935 they amounted to only 67,600 lb. (27,767 yen), mainly from the United States. In 1935 imports of citric acid amounted to 213,866 lb. (124,339 yen), a slight decrease from the previous year. Germany, Italy, Belgium, Great Britain and France were the suppliers. The bulk of the crude caustic soda imports, which amounted to 22,151 short tons (2,913,430 yen) in 1935, comes from Great Britain. The United States, Russia, Belgium, and Germany are smaller contributors. While these imports are substantial, domestic production is much greater. The bulk of this product is consumed in the paper and rayon industries, and in dyeing and soap-making. Soda ash was imported to the extent of 42,682 short tons (2,574,380 yen) in 1935, and 41,265 short tons (2,829,912 yen) in 1934. Kenya and Uganda are responsible for over 40 per cent. of the trade. China, Great Britain, and the United States are among the other suppliers. There is a large production of soda ash in Japan; production was formerly assisted by subsidies.

Great Britain is the source for most of the bicarbonate of soda imported into Japan. Total trade amounted to 2,660 short tons (206,126 yen) in 1935. This product is principally used in the manufacture of soap, yarn, and drugs. Japanese production is increasing and supplying a larger portion of the country's requirements each year. Imports of crude nitrate of soda amounted to 69,472 short tons (5,422,753 yen) in 1935, a considerable increase over the previous year. Sources were Chile and the United States. In 1935 the United States supplied practically the whole of the imports of borate of soda, which amounted to 8,097 short tons (1,509,060 yen). Total importation of cyanide of soda and potash was 366 short tons (305,843 yen) in 1935, practically all supplied by Great Britain. Domestic production is extremely small. In 1935 imports of crude chloride of potash amounted to 85,406 short tons (8,934,788 yen) and 50,950 short tons (5,790,145 yen) in 1934. Supplies were secured from the United States, Germany, Russia, and Spain. Domestic production is very limited and takes care of only a small part of the demand; it is principally used as a fertilizer material.

Ammonia Imports

In 1935 imports of ammonia amounted to 265,109 short tons (21,069,356 yen). Each of the last three years have shown increases. Germany supplies practically the whole of these imports, with Great Britain and Manchukuo supplying the remainder. Japanese and Korean production takes care of most of the domestic requirement, and imports are allowed only on permit to supply the estimated deficiency. Carbonate of ammonium imports are small, amounting to only 39 tons (16,282 yen) in 1935, and come almost wholly from Great Britain. Japanese production is negligible and of poor quality. A decrease has been registered in each of the last few years in the imports of acetate of calcium. Trade amounted to 383 short tons (60,230 yen) in 1935 as against 806 short tons (127,707 yen) in 1934. The United States is the largest supplier, followed by India and Germany and other European countries.

Increased domestic production of formalin has been the cause of reduced imports. In 1935 they totalled only 546 lb. (530 yen); in 1934 they were 37,954 lb. (6,037 yen). Formalin comes principally from the United States and is used mostly in the manufacture of synthetic resin and as an antiseptic. Imports of crude sulphate of potash amounted to 94,026 short tons (10,217,677 yen) in 1935, and 54,305 short tons (6,065,388 yen) in 1934. The bulk of this product is secured from Germany; small quantities are credited to France, Great Britain and Spain Japan has an increasing production of chlorate of potash, which is fostered by a subsidy, and as a result imports are decreasing. In 1935 they amounted to 107 short tons (47,946 yen), as against 575 short tons (189, 740 yen) in 1934. The chief source of supply is Sweden. Bichromate of potash imports in 1935 totalled 95 short tons (53,144 yen) and were principally from Germany. Japan's output is increasing. Supplies of bichromate of soda come from Russia, the United States and Germany, and amounted to 273 short tons (111,642 yen) in 1935 and 271 short tons (113,571 yen) in 1934. Domestic production exceeds imports and is increasing.

Chloride of ammonium imports amounted to 1,002 short tons (180,326 yen) in 1935 and 1,044 short tons (185,447 yen) in 1934. Sources were Great Britain and Germany. Chloride of ammonium is not produced to any extent in Japan. Imports of methyl alcohol are on the decline due to increased domestic production. The bulk of the demand, however, is still satisfied by imports, which in 1935 amounted to 2,628 short tons (694,097 yen) as against 2,889 short tons (1,149,368 yen) in 1934. Germany and the United States are the sources of supply. During 1935 and 1934 imports of glycerine amounted to 177 short tons (188,766 yen) and 724 short tons (449,411 yen) respectively. Domestic production far exceeds imports, which have been decreasing over a period of years. Great Britain at present supplies most of these imports.

Total imports under the heading of Rongalite and other similar reducing agents amounted to 333 short tons (186,107 yen) in 1935 and 482 short tons (268,886 yen) in 1934. Germany is the chief supplier. Smaller amounts are credited to the United States, Switzerland and Great Britain. Naphthalene imports amounted to 4,526 short tons (697,292 yen) in 1935 as against 3,712 short tons (560,426 yen) in 1934. Germany ships more than half of these imports. The remainder of the trade is shared by Belgium, Russia, the United States, and Great Britain. Production is fairly large in Japan and is normally greater than the imports. Only a small amount of milk sugar is produced in Japan. As a result imports have been gradually increasing, and amounted to 477 short tons (307,572 yen) in 1934.

German Carbide Plant

Sold to Precious Metal Combine

THE Deutsche Gold-und Silberscheide-anstalt A.G., of Frankfort-on-Main, controlling the entire German precious metals industry has purchased with its own resources the carbide plant of the Carbidfabrik Wyhlen G.m.b.H., situated at Wyhlen, Upper Rhine, not far from the Scheideanstalt's Rheinfelden pant specialising in the production of electro-chemical products, chiefly the per-salts. The carbide output of the Wyhlen plant will continue to be marketed through the Carbide Association, of which the Scheideanstalt has now become a member. The Scheideanstalt has steadily extended the scope of its interests in the chemical sphere in recent years, almost each succeeding year witnessing the addition of a further chemical plant or new field of chemical production to its increasingly-varied chemical interests. In 1932 it gained complete control of the wood distillation industry (Haig) and in succeeding years acquired an old-established pharmaceutical house (Homberg), the leading producer of gas-mantles, rare earths, radio-active materials, gas-masks, etc. (Degea A.G.), and the leading lamp-black producer (Wegelin). In face, the Scheideanstalt has been responsible for the majority, if not nearly all, of the principal mergers occurring in the German chemical industry in recent years.

A New Market for Home-Manufactured Chemicals

By " RAFFINATE "

FOR many years the possibility of oil occurring in Great Britain, in sufficiently large quantities to warrant commercial exploitation, has been discussed. The Government, alive to national necessities, has granted concessions, covering large areas, to certain organisations, and the work of drilling is already well advanced. Should present prospecting meet with success, England may be on the verge of establishing an important industry new to the country, *i.e.*, the production of crude petroleum. Simultaneously, a most important market will be opened for chemicals of all kinds.

Chemicals are used regularly throughout the petroleum industry, but by far the most important section is that in which they are used for refining various products for the market. The refining work to be carried out depends on the type of crude produced, but it is hoped that the crude produced would provide motor spirit, white spirit, kerosene, diesel oil and lubricants. The refining of motor spirit consists chiefly of the removal of sulphur compounds, gum producng substances, and the improvement of colour. Sulphur exists in petrol as free sulphur, as hydrogen sulphide, and organic derivitives such as mercaptans, di-sulphides and thiophen, while gum-producing substances are mainly unsaturated hydrocarbons.

Petroleum Refining Reagents

Most widely used of all refining mediums is caustic soda, solutions of varying strengths being employed throughout the refinery. Although it completely removes hydrogen sulphide, and usually free sulphur, it has little effect on mercaptans, and gum-forming bodies, and recourse is had to other mediums when these impurities are present. Next in importance is the well-known sodium plumbite solution, prepared from caustic soda and litharge. For petrol containing considerable quantities of organic sulphur compounds, this reagent is almost a necessity. A third important refining medium is the hypochlorite of either calcium or sodium. It often succeeds where the others fail, and for sulphurous crudes would probably be used in fairly large quantities. Calcium hypochlorite is most frequently used, and the strength of the solution varies from 0.2*N* to 0.5*N*, containing 0.5 gm. to 1.0 gm. of free alkali per litre. This is necessary to prevent the solution from becoming acidic during use, when chlorination of the petroleum would take place. The foregoing are the chemicals which are required for the three principal refinery methods, but there are many others used for special purposes, and to overcome particular difficulties. For example, lime is as good a refining medium as caustic soda, but is far less soluble; hence much larger quantities of solution have to be handled, thereby increasing costs. It is sometimes used in the form of a slurry, but this method is not popular. Ammonium, calcium or sodium chloride can be added, thereby increasing the solubility of the lime, but this is not often done. Could a better method for the use of lime be discovered, it would probably displace caustic soda to a large extent on account of its lower cost. Ammonium hydroxide is used for neutralisation purposes; magnesium hydroxide, in granular form, for the removal of hydrogen sulphide; metallic sulphides for the removal of particularly obstinate mercaptans. Continuing the list, there are silica gel, zinc chloride, copper-aluminium solutions, and a special process, known as the " Instill," which makes use of a mixture of adsorbant earth. and iron persulphate. Thus it is seen, at this early stage, that the chemical requirements for petroleum refining promise to be very wide.

Excellent as are the refining mediums mentioned, if they only are used, the finished product may have a bad colour, or may deposit gummy and resinous bodies on storage, and in order to refine the product completely, acid washing is carried out. Almost from the birth of the petroleum industry, sulphuric acid has been used as a refining agent, and is to-day very widely used, in strengths varying from 60 per cent. upwards, and then up to 20 per cent. oleum, in the refining of almost every type of petroleum product known. For the treating of petrol, care must be taken that the acid used is not too strong, and solutions of 60 per cent. up to 95 per cent. are usually employed. After acid treating, the finished product must be neutralised, and for this purpose caustic soda and lime are again frequently used.

Neutralisation, however, introduces another market, that of decolourising and neutralising earth. Those best known and most widely used are fuller's earth and bauxite. They give good results, but are often inferior to specially activated clays. The action of these clays is that of " adsorption," and by activating a clay of magnesium and aluminium silicate base, an exceedingly powerful refining medium is produced. Clays are constantly being examined, as the best at present came from the Continent, and should a suitable one be discovered in this country a ready sale would be found.

White spirit is treated in exactly the same way as petrol, and requires the same chemicals, but as colour is very important here acid treating is almost always required to give a first-class product. Kerosene, again, requires very similar treatment, but in addition to the importance of good colour, kerosene must burn with a non-smoky, and practically odourless flame. This almost always necessitates the use of acid, of 98 per cent. strength, followed by some form of neutralisation. Diesel oil, the last product of distillation before the commencement of the lubricating oil fraction, usually requires no refining; but if it is to be used for special purposes, an acid wash is given, followed by neutralisation with caustic soda. Lubricating oil is usually treated with sulphuric acid (S.G. 1.84), in amounts varying from 0.5 per cent. to 6.0 per cent., according to the requirements of the finished product. Neutralisation is then almost always carried out by a high-grade activated clay, and large quantities of acid and clay will certainly be required if crude oil is found in this country. This, however, is only part of the lubricating oil requirements.

For the producton of white oils and transformer oils, oleum is used. The strength usually required is 20 per cent. " fuming " and is often used in quantities up to 50 per cent. by volume of the oil being treated. These oils are finished by washing with a 50/50 mixture of caustic soda solution and industrial alcohol, thus introducing still another requirement. At present, most of the transformer oil on the market is refined on the Continent, owing to the high price of acid in this country.

Demands of a Successful Oil Industry

A successful oil industry established in the country will therefore demand large quantities of caustic soda, sulphuric acid of various strengths, " doctor " solution, hypochlorite solutions of correct strengths, and high quality decolourising and neutralising earths. As to actual quantities required, let us assume an average size well is brought into production, and that 5,000 barrels of crude, giving motor spirit, white spirit, kerosene and lubricating oil have to be refined each day. Then average daily requirements would be somewhat as follows:—Caustic soda, 5 tons; " doctor " solution, 1 ton; sulphuric acid, 8 tons (S.G. 1.84); " earth," 5 tons; and hypochlorite (if used), 10 tons (0.3 normal). This, however, does not by any means cover the demands likely to be made. The most recent development in lubricant refining, and one which may eventually displace sulphuric acid, is that of solvent extraction.

Lubricating oil consists of a mixture of a great number of hydrocarbons, those of the paraffin type being of most value, and those of naphthenic and asphaltic base of lesser lubricating value. It has been found that certain solvents can be used which separate these classes of hydrocarbons, more or less

completely. Some, such as dichloroethyl-ether, are manufactured under patent, but others, of perhaps greater importance, could be or are already being prepared in the country. Among those may be mentioned liquid sulphur dioxide, phenol, cresol, furfural and nitrobenzene. One of the most important requirements at present is liquid pentane, which is prepared in America from the natural gas given off from the oil wells. Whether it could be prepared from the natural gas already produced in this country is a matter for further investigation. That there will be an increasing market for these solvents, and others as they are discovered, is certain, as exceedingly large quantities are used in the various processes. A further market, although somewhat specialised, covers such classes as "dopes," dyes and inhibitors.

Owing to the increasingly high compression ratios used in modern internal combustion engines, it is constantly being found necessary to "dope" the petroleum spirit, to prevent "knocking" in the engine. Benzole is frequently used, and also power alcohol, but probably the best-known of all is lead tetraethyl, which is the most efficient. Unfortunately, this is manufactured in America under licence; could another substance as good be manufactured in this country, the market would be waiting, whether oil is found here or not. Certain classes of Diesel fuel are improved by the addition of some substance which lowers the spontaneous ignition point. Compounds so far used are principally nitrated, such as the chlorohydrins, and certain nitrates. A completely satisfactory "dope" of this class has yet to be discovered, so that here is opportunity for research work, with a waiting market.

Some classes of motor spirit contain an extra large proportion of unsaturated and aromatic hydrocarbons. These tend to raise the octane number of the finished fuel, and hence it is desirable to leave them there. Unfortunately, on storage, unsaturateds tend to oxidise and give the petrol a bad colour, and cause it to deposit gum in any engine in which it is used. At the same time the octane number falls. Many chemical compounds, added in small quantities, have to be found to prevent this auto-oxidation.

In conclusion, there is one point to be borne in mind, which is perhaps not quite so encouraging. That is the synthesis of chemicals from petroleum itself. Great strides have been made recently in this direction, in America, and among those compounds produced on a commercial and economic scale are iso-propyl alcohol, amyl alcohol, ethylene chloride, ethylene gycol, ethyl alcohol, formaldehyde, methyl chloride, chloroform and carbon tetrachloride. Derivatives include such classes as soaps, denaturants, insecticides, solvents, explosives, plastics, anæsthetics, and others. Thus, while a thriving petroleum industry can and will provide a vast market for home produced chemicals, it will, as research continues, become an increasingly formidable competitor.

The Advertising Association Cruise

A Memorable Convention

THE Advertising Association will have reason to look back on 1936 with pride, because it is likely that the novel convention which ended on July 17 will set an entirely new fashion. The eleventh annual convention took the form of a cruise to the northern capitals in a specially chartered ship, and lasted nearly a fortnight. The receptions accorded to 350 leading representatives of the Press, printing and publicity world by the Danish, Norwegian, Finnish and Swedish Advertising Associations exceeded everyone's expectations, and the delegates, led by Sir Ernest Benn, president of the Association, had a truly royal progress in the four capitals which they visited.

The cruising ship "Voltaire" left Southampton on July 4, and arrived at Copenhagen on July 7. Informal meetings with Danish advertisers, agents and newspaper proprietors created an extremely friendly atmosphere, which was maintained at the formal meeting between the English and Danish associations in the afternoon. Later, the Danish association entertained the English visitors to a banquet, in the course of which Sir Ernest Benn, on behalf of all his colleagues, presented the Danish association with a silver loving cup in memory of their meeting.

The "Voltaire" sailed on July 8, and the rest of that day and most of July 9 were spent at sea. During this time, as during the passage through the North Sea and the Kiel Canal, domestic problems affecting the Association were discussed on board. At Stockholm the delegates were welcomed at a meeting attended by the son of the Crown Prince of Sweden and his wife. The visit to Sweden concluded with a joint luncheon with the Swedish Advertising Association.

From Stockholm the "Voltaire" sailed for Helsingfors, which was reached on July 11, and after a sightseeing tour through the town and surrounding country, the Finnish Advertising Association entertained the visitors at a luncheon attended by the Finnish Minister of Foreign Affairs. The afternoon was spent shopping and visiting. The Saturday evening, Sunday and Monday were spent at sea, when there were further departmental meetings of the Advertising Association.

On July 14 the "Voltaire" arrived at Oslo, and delegates were taken to see the famous Viking ships, the National Museum and other show places near Oslo, coming back into the city for a lunch as the guests of the Norwegian association, lunch being followed by a joint meeting. At each port of call the Association received a great welcome, but many felt that the gesture of the Norwegian association in presenting to the visitors a magnificent model of a Viking ship was perhaps the most charming gesture of all. Sir Ernest Benn, in return, gave the Norwegians an English rose bowl. After steaming slowly through the North Sea on Wednesday and Thursday, the ship arrived at Southampton on Friday morning, July 17.

An Experiment Worth Making

The cruising convention was in the nature of an experiment, but it proved an experiment well worth making. The four northern countries belong to the sterling area, and are already closely linked to this country by many long standing commercial and cultural ties. The visit of the British advertising men and women did a great deal to cement existing friendships between these countries and our own and to create new ones. The Press of all four capitals devoted columns of space and many photographs to the visitors, and perhaps the only regret that can be expressed about what was in every other respect a most successful venture was that the Press of Great Britain did not devote sufficient attention to it. This omission, however, is likely to be repaired now that the delegates are home, because the Council of the Advertising Association has already decided to publish a full report of the work done by this unusual and successful trade mission.

Sir Ernest Benn was no stranger to the northern capitals, and wherever he went was greeted as an old friend. To mark their appreciation of his wonderful work all on board the "Voltaire" subscribed to a fund, which was started quite spontaneously by an ordinary delegate, and as a result were able to give Sir Ernest a handsome cheque towards the funds of the East End Hostels Association.

Food and Drug Frauds

Report of the City Analyst for Salford

IN his annual report for 1935, Mr. H. E. Monk, B.Sc., F.C.S., city analyst for Salford, reports a few entertaining cases arising from the examination of 1,275 food and drug samples during the year under review.

Of 1,020 samples of milk 47 were adulterated or below standard. This figure represents a percentage of 4.6, the highest since the year 1925, when the figure was 4.7 per cent. Of the 47 unsatisfactory samples, 13 were below the limit for fat, raising the presumption that they had been skimmed, 24 had apparently been watered, three were defficient in both fat and solids-not-fat and 7 contained added colouring matter. It is interesting to notice that these 47 samples represented but 15 " cases," because the steps which the sampling officer takes as a matter of course in following up an adulterated sample may lead him backwards to the chain, retailer-wholesaler-farmer, and on occasions to the cows themselves. Such measures inevitably lead to a multiplication of samples, but the most important fact of all is that in only three cases were proceedings instituted.

Colouring Matter in Milk

An unusual case concerned the addition of colour to milk. The colour used was annatto which is derived from the berries of a shrub which flourishes in Central America and India. It is used in colouring cheese and sometimes butter and for such purposes its employment is legal. At one time it was not uncommon for dairymen to add it to milk to give an unwarranted appearance of richness, but to do this to-day is contrary to the law, and it is very rare to meet a case of such addition.

Two labelling offences were committed with regard to margarine. In one case the wrapper was absolutely plain and did not bear the word " margarine " as is required by Section 6 of the Food and Drugs Act. In the other case the label bore this word in type of correct size, but in addition other matter which is not allowed.

A sample of treacle was found to contain 400 parts per million of zinc. The vendors surrendered the remainder of their stock to the City Analyst's Department, when a further examination was made. Five further tins were examined and the amounts of zinc found—varying from 18 to 35 parts per million—might be taken as reasonable when it is remembered that one pound of molasses remains from the repeated cane.

Zinc in Treacle

Subsequent repeat examinations of the amounts of zinc found in the first tin showed that the greatest concentration of zinc had been at the top of the tin. The figures obtained were 640, 425, 355 and 170 parts per milion, representing four successive determinations, including the first. Although the sample had been stirred before analysis the circular stirring of a substance like treacle might well result in an impurity present chiefly at the top not being evenly distributed. Stirring was deliberately avoided before the subsequent analyses.

No objectionable amount having been found in those of the remaining tins examined, what remained of the consignment was returned to the vendors. The makers of the molasses, who had been considerably perturbed by the occurrence of zinc in the first tin, acted throughout in a most straightforward manner and placed all information and facilities at the disposal of the city analyst. It is probable that they were in no way responsible for the presence of the impurity in the first tin—the fact of which they confirmed in their own laboratories—and it is not considered that zinc is a likely impurity to recur in treacle in the ordinary course. Its presence in this case was first detected in employing the ferrocyanide test for copper.

One informal and three formal samples of sausage were unsatisfactory. The informal sample, bought as pork sausage, was unsatisfactory in three respects: (a) it contained sulphite preservative (70 parts per million) which were not declared either on the label or by notice in the shop; (b) it was a beef and not a pork sausage; (c) it contained but 38 per cent. of meat, the remainder consisting of 37 per cent. of bread and 25 per cent. of added water. Regarding (a) there would have been no offence if a notice had been displayed in the shop to the effect that the sausage sold contained preservative; but (b) and (c) are more serious.

In recent years in Salford a relatively higher percentage of the samples of drugs than of foods have been certified as adulterated or unsatisfactory. This implies no reflection on the care or honesty of the regular members of the drug trade, including manufacturing, wholesale or retail chemists. There has been much evidence of the activities of what, for want of a better name, must be called the cheap drug trade selling such articles as lysol or iodine preparations, chiefly in markets or by hawking from door to door, and a large number of the samples to which objection has been taken in recent years have been the products of this type of trade.

Iodine Preparations

Iodine preparations include ointments of various kinds and variants on the solution of iodine which is still probably better known by the older name of tincture of iodine. Following upon the " iodine " cases reported in 1934, several firms have re-christened their products; what was formerly " iodine " or " solution of iodine " has become " iodine paint " without any change in composition. After the prosecutions referred to, the firms involved, and several others engaged in the same type of business, approached the public analyst regarding the composition and descriptions of these preparations. There appears to be no reason why a cheaper product should not be available to the public and such a product can be made by replacing the alcohol of the Pharmacopœia by industrial methylated spirit. Such products cannot, of course, be called by the name or synonyms of the Pharmacopœia, and on several occasions Iodine Paint (Methylated) was suggested. On the question of a standard for this product, a minimum of 2.5 per cent. iodine would have been adopted but for the existence of the Home Office recommendation of 2.0 per cent. of iodine (in alcohol) for first aid boxes in factories and workshops. Under the circumstances, therefore, it was felt that a minimum standard of more than 2.0 per cent. could hardly be adopted, and consequently, as a working basis, 2.0 per cent. of iodine in industrial methylated spirit of reasonable strength has been taken as a minimum requirement.

A number of samples of Lysol soap were examined last year when the conclusion was reached that an article so labelled should contain a minimum of 2 per cent. of Lysol in order to justify the name. At the same time a difficulty was felt about the legal means whereby any such standard should be enforced. Lysol soap is certainly not a food and it is at least doubtful if it could be called a drug within the meaning of the Food and Drugs Act.

SODIUM silicofluoride, a by-product of superphosphate manufacture in Denmark, is an important export item. In Danish export statistics sodium fluoride and sodium silicofluoride are combined in one item, with the total trade reported for 1934 at 1,709 metric tons and for 1935 at 1,912 metric tons. It is apparent that the silicofluoride predominates in these totals. United States import trade statistics for sodium silicofluoride show total imports during 1934 of 3,314,220 lb., and for 1935 4,116,093 lb., whereof Denmark supplied 2,072,546 and 2,260,927 lb. respectively.

New Technical Books

REACTIONS OF ORGANIC COMPOUNDS. By Wilfred John Hickinbottom. Pp. 449. Longmans, Green and Co., 16s. net.

The aim of this book is to present the facts of organic chemistry from the point of view of laboratory practice. Wherever possible, the author has also endeavoured to indicate the limitations of the so-called "general reactions." The reactions of the more common groupings are treated on a broad and comprehensive basis, while abundant references provide a key to the more detailed examination of each subject. A useful appendix has been included on the identification of organic compounds.

* * *

INSECT PESTS OF GLASSHOUSE CROPS. By Herbert W. Miles and Mary Miles. Pp. 174. Surbiton: H. C. Long. 8s. net.

Introduced in a foreword by Mr. J. C. F. Fryer, director of the Plant Pathological Laboratory of the Ministry of Agriculture, this book has been prepared in the hope that it will prove of real value to all who grow flowers, fruit and vegetables under glass, including workers at experimental farms. It contains many details of great interest, and the illustrations are exceptionally good. There is no other English book that deals solely with the subject it covers. There is a valuable appendix giving an alphabetical list of the chief glasshouse crops with associated pests and their characteristic injury.

* * *

BUSINESS MAN'S GUIDE TO MANAGEMENT. By G. E. Milward. Fourth annual edition. Pp. 105. London: Management Library. 3s. net.

The announcement that the present Government proposes to spend £10,000,000 on education for industry, commerce and other technical subjects, underlines a growing interest in the subject covered by the 1936 edition of this book, which is designed, by means of a subject index and appropriate reviews, to enable the reader to make a choice of the book or books which contribute practical information on any given problem, irrespective of title, author or country of origin. The individual sections are printed on paper of various colours to facilitate quick reference.

* * *

THE CERAMISTS' ANNUAL, 1936 (Taschenbuch für Keramiker, 1936). Published by the Chemisches Laboratorium für Tonindustrie und Tonindustrie-Zeitung. Berlin: H. Seger and E. Cramer, G.m.b.H.

The 1936 edition of this book surpasses all known good pocket annuals and almanacs, and gives an excellent account of progress in the ceramic industry during the past year. The publishers have assembled a collection of German patents granted last year in the ceramic industry and systematically arranged them. Its well-arranged presentation is so good that it may be hoped that the publishers will not only repeat it each year, but if possible extend it by dealing similarly with British patents.

* * *

DISTILLATION. By Joseph Reilly. With a Foreword by Professor Sydney Young, F.R.S. Pp. 120. Methuen and Co., Ltd. 3s. 6d. net.

One of a series of monographs on chemical subjects, this book gives some useful information on recent developments in the theory and practice of the various aspects of distillation, especially in respect of newer methods. The subjects which receive attention include fractionating columns, vacuum fractionation, azeotropic mixtures, distillation in steam, destructive distillation and sublimation. Industrial distillation methods, which are now extensively employed in the purification of organic substances, are described, and in many cases the descriptions are amplified with diagrams. The author is professor of chemistry at the National University of Ireland, and as a technical member of the Irish Free State Industrial Alcohol Advisory Board he is recognised as an authority on the production of absolute alcohol by the azcotropic process.

MORE CERAMIC INSULATING MATERIALS (Mehr keramische Isolierstoffe). Berlin: Verband Deutscher Elektrotechnischer Porzellanfabriken.

It has long been the usual custom in America for groups of manufacturers of the same article, *i.e.*, competitors for the same engineering material, to advertise in common, whether it be bakelite or glass or roofing tiles. The propaganda serves first and foremost to make the material known as such, and to describe its advantages. In the present case the Federation of German Electro-technical Porcelain Manufacturers has undertaken the task of publishing a propagandist work on behalf of the porcelain factories. In a comparatively small place actually everything essential is described concerning electrical porcelain, steatite and modern ceramic insulating materials.

* * *

ELECTRIC FURNACES (Elektrische Ofen, Fortschritte des chemischen Apparatewesens). Parts 5 and 6. Edited by Adolf Bräuer and Josef Reitstötter. Leipzig: Akademische Verlagsgesellschaft m.b.H.

If the importance of electric furnaces was great when this book began to appear a few years ago, it must be said that now, with the appearance of the final part, that importance has increased exceedingly. The value of electric heating is continually growing. Such a comprehensive collection is therefore specially worthy of appreciation, and will be welcomed by all those interested. The present parts contain sections devoted to clay ware, porcelain, refractories, ceramic bodies and glazes; laboratory technique; chemical technique; and the working of metals.

* * *

VITAMINE AND HORMONE. Part 1: Ergebnisse der Vitamin— und Hormonforschung. By Dr. Helmut Bredereck. Leipzig: Verlag von S. Hirzel. Pp. 101. RM. 6.

This monograph is mainly in the nature of a progress report on current investigations on the structural problems with which biochemists in many countries are wrestling. Few departments of organic chemistry can boast of (or deplore!) so vast a research literature as that pertaining to vitamins and hormines, and the compiler of this little monograph has consequently approached the formidable task of recording the outstanding achievements of recent years (down to 1935) with fitting humility. Whatever its omissions, it can justly be recommended as a valuable introduction to newcomers to a subject the fascination of which is matched by its human importance. Of greater interest to the technical chemist will be the companion volume, now in preparation, dealing with the production of vitamins and hormones on the technical scale.

* * *

THE CHEMISTRY OF MILK. By W. L. Davies. Pp. 522. Chapman and Hall, Ltd. 25s. net.

The contents of this book, written by a research chemist and analyst at the National Institute for Research in Diarying, Shinfield, near Reading, will appeal to those interested in pure as well as applied chemistry, to nutritionists, and to the medical profession. The book is divided into five main sections: Composition of milk, constituents of milk, physical chemistry, the chemistry of milk processing, and nutritive value. About 1,400 references are included in the text, so that the book makes a special appeal to serious students of dairy science. The section on the chemistry of milk processing should be of special value to workers in milk technology and in food technology in general. It treats of the effect of heat on milk, effect of milk on metals and of metals on milk, milk condensing, cooling and sterilisation, and also of methods of drying milk by the roller process and by the spray process. Although plant is described there are, however, no illustrations—possibly a commendable feature in view of the non-uniform viewpoint of plant manufacturers when supplying photographs of their plant for reproduction in a text. Some plant makers, it is well recognised, are so very secretive, whilst others do not mind divulging all details.

THE CHEMICAL FORMULARY. Vol. III. Edited by H. Bennett, with the assistance of a Board of Editors. Pp. 566. Chapman and Hall, Ltd. 25s. net.

The insistent demand for new formulæ for making the thousands of products which are used in various fields of industry, following the publication of Vols. I and II of this work, has called for a third volume one year in advance of the original plan. Included in this present volume are recipes for a very wide range of products extending from adhesives to soups, far too numerous to mention. To make reference more easy the index is inclusive of the two previous volumes, so that three separate indices need not be consulted.

* * *

THE THEORY OF EMULSIONS AND THEIR TECHNICAL TREATMENT. By William Clayton. Third edition. Pp. 458. J. and A. Churchill, Ltd. 25s. net.

The author of this book is chief chemist and bacteriologist to Crosse and Blackwell, Ltd. His endeavour has been to keep as closely as possible to the central theme, border-line subjects only being considered when special reasons make this course essential. In this new edition the range of inquiry has been greatly extended, especially on the technical side, and patent literature has been freely consulted, since intensified technical applications of the physical chemistry of emulsions have now become numerous. The previous edition, published in 1928, was translated into German and Russian.

* * *

CRUSHERS FOR STONE AND ORE: THEIR DEVELOPMENT, CHARACTERISTICS AND CAPABILITIES. By William T. W. Miller. Pp. 234. Mining Publications, Ltd.

This book is founded on a series of articles which have appeared in two American mining journals. It appears to be a very practical work, well illustrated in line and half-tone, which will be found useful wherever crushing machinery is employed. In a short introduction, Sir Robert Hadfield points out that the author was engineer-in-charge of the crusher department at the works of Hadfields, Ltd., Sheffield, for 25 years, and his practical experience in the design and construction of crushing plant for the many and varied operations in which crushers are used has therefore been a very extensive one. Here, then, we may learn all that matters to users of jaw crushers, toggles and toggle bearings for jaw crushers, gyratory crushers, crushing heads, bearings and suspension systems, the relative merits of jaw and gyratory crushers, crushing rolls, roll shells, bearings and adjusting devices, disc crushers and swing hammer crushers. A separate chapter is devoted to the considerations involved in the choice of a crusher for a particular job.

* * *

A SYSTEMATIC HANDBOOK OF VOLUMETRIC ANALYSIS. By Francis Sutton. Twelfth edition. Revised throughout by A. D. Mitchell. Pp. 631. J. and A. Churchill, Ltd. 35s. net.

The first edition of this book was published in 1863, the eleventh edition in 1924. With a tradition of seventy years behind it the task of revision was not therefore to be taken without a feeling of diffidence. Generally, the plan of previous editions has been followed, and in order to prevent an undue increase in the size of the book, new subjects have been added only when their inclusion seemed essential in view of a greatly increased use. The selection of methods, as usual, has been a debatable problem, indeed, for this edition, very much more debatable. The deleting of some of the other methods of analysis has been determined by considerations of accuracy, convenience and rapidity. New methods have also been carefully considered, but being so prolific it has, of course, been impossible to give personal experience in *all* the methods which are included; this, however, was a valuable feature of earlier editions. In general the aim of the book is to give the recognised standard methods in full detail, and to add notes on other methods in less detail. A section on "Potentiometric Titration" has been very concisely written by Dr. S. Glasstone, but space did not permit the inclusion of a section on "Microchemical Titration."

AN INTRODUCTION TO ORGANIC CHEMISTRY. By Alexander Lowy and Benjamin Harrow. Fourth edition. Pp. 429. Chapman and Hall, Ltd. 15s. net.

This book was first published in 1924, with the object of weaving into one simple and readable narrative the entire story of the well-recognised basic principles of organic chemistry and its more recent and most important applications. In the new edition there is a considerable amount of new material, including a chart summarising the important reactions of acetylene and products derived from it. A feature of the book, as in previous editions, is the inclusion of a number of special charts illustrating the uses of a few important chemicals, such charts being very welcome if only to give the reader some idea of the many and diverse uses to which organic substance may be put.

* * *

MODERNEN KOLLOIDWISSENSCHAFT. By Dr. A. von Bonzagh. Leipzig: Verlag von Theodor Steinkopff. Pp. 323. RM. 16.50.

THIS is a work on a much bigger scale—one might almost say an imposing one—by a pupil and enthusiastic admirer of Wolfgang Ostwald. When Ostwald published his classical "World of Neglected Dimensions" (which, incidentally, has gone through ten editions) he gave it the subtitle of "an introduction to modern colloid chemistry," but the fashion is now to avoid stressing the chemical side of colloids. "Colloidics, an introduction to the problems of modern colloid science" expresses Dr. Bonzagh's feeling that chemistry and physics are inextricably linked up in the theory and applications of the colloidal form of matter, a form now recognised as quite distinct from the solid, liquid or gaseous states. The work is an able and well-planned presentation of the many diverse channels of colloid research which should make a strong appeal to post-graduate workers in this field.

Coal and Allied Industries, Ltd.

Yields from New and Reconstructed Plant

THE directors of Coal and Allied Industries, Ltd., in a report on the company's progress since the last shareholders' meeting, state that certain reconstructions and changes were found to be necessary, and operations were restarted on the carbonising battery on May 20. For the purpose of economic operation in starting up, one-half of the battery only was nursed into production, and by this means the necessary crude by-products were obtained for testing the oil refinery section and the chemical section. Changes in the oil refinery were completed on June 15, and the refinery was put into operation on that date. It was also found necessary to build a new chemical section, which was completed by July 10, and during operations since that date it has successfully processed gas at the rate of approximately one-quarter of the total gas being produced at the battery.

Results obtained are as follows:—Carbonising section (results since May 20).—Processed:—Coal, 1,703 tons; fuel oil, 1,174 tons. Yield:—Semi-coke, 1,500 tons (sold); crude oil for refining, 701 tons; gas, etc. (by difference), 676 tons. Refinery section (results since June 15).—Processed:—Crude oil, 278 tons. Yield:—Crude petrol, 12,800 gal. (includes approximately 6,000 gal. light spirit recovered from part of the gas); crude white spirit, 1,820 gal.; heavy distillate, 14,870 gal.; intermediate products, 11 tons; residue for return to carbonising battery, 175 tons. Chemical section (operations just begun).—Carbolic acid, 280 lb.; cresols, 200 gal.; finished white spirit, 140 gal.; finished aviation spirit, 390 gal.; iso propyl alcohol, para cresol, and thymol are in process of production, and sample quantities of finished specification products meeting market requirements have been made.

A further detailed report on plant capacity and yield data will be issued after the plant has been in steady operation for a reasonable period. The directors have decided to grant a further extension until September 30, 1936, of the options expiring on July 23.

Chemical Matters in Parliament

Oil from Coal

IN the House of Commons on Tuesday, Mr. E. Shinwell asked the Secretary for Mines whether, in view of a suggestion by the President of the Board of Trade that the erection of hydrogenation works at Jarrow should receive further consideration, the Government contemplated taking steps to extend coal-oil production in the near future.

Mr. Joel (Dudley) also asked whether the Government was prepared to give any assistance to interests wishing to establish hydrogenation plants in this country, other than by the absence of any Excise duty on home-produced petrol.

Captain Crookshank replied that so far as the development of the hydrogenation process was concerned, the Government did not consider it feasible, until more definite results were available of the commercial scale experiment which was being carried out at Billingham, to decide whether, in order to secure the further development of the process any revision was necessary in the form or measure of assistance which was afforded to such processes by the British Hydrocarbon Oils Production Act 1934 which was very considerable. The possibility of stimulating the production of oil from indigenous sources in this country was constantly under review and the Government would not hesitate to take any further steps which they were satisfied would be practicable and desirable to secure this.

Mr. Shinwell.—If the Government cannot go beyond what the hon. member has indicated can he explain why the President of the Board of Trade advised that the proposals for installation of hydrogenation plant at Jarrow and elsewhere should be pursued?

Captain Crookshank.—I have replied on the general position of all these processes. When and if any of them are found to be commercially feasible all sorts of considerations will arise. All my right hon. friend had in mind was that those interested in the matter should keep alive to the situation which may develop.

The Distillers Company, Ltd.

Substantial Reserves for Chemical Activities

PRESIDING at the annual meeting of the Distillers Company at Edinburgh on July 17, Mr. Thomas Herd said competition was becoming more intensive on the industrial alcohol side of the company's business, and the margins of profit were small in proportion to the capital employed. The directors took no exception to this, as they had always realised that industrial spirit was the base for many other products. The fact of its cheapness had undoubtedly encouraged its increased use. In 1934 reference was made to the motor fuel known as "Cleveland Discol," the alcohol content of which was exclusively supplied by the company. The demand was developing satisfactorily, and he thanked stockholders who were motorists for the support they had given by purchasing this product, and asked them to recommend it to their friends. The full productive capacity of the company's "Gyproc" plaster board factory at Rochester was being taken up, and the demand for "Gyproc" was such that they had authorised the erection of another factory.

Dealing with the chemical activities of the company, Mr. Herd said that for a considerable time they had devoted a great deal of attention to this department. Alcohol was the raw material and basis for a large range of solvents and other chemicals required in modern industry, and new synthetic processes of conversion were discovered and applied with great rapidity. While to-day they might be satisfied with many of their processes, to-morrow new discoveries might render these obsolete, and they had to adapt themselves to such changes from day to day. In chemistry, as in many other things, it might be said that "there is nothing more permanent than change," and the extraordinary amount of research work going on throughout the world at a feverish rate was not only interesting but disturbing. It was essential that the company should keep abreast of all such developments.

In this chemical development, not only in their own research and in their capacity to advise on any new process offered to the company, but also in the daily routine of checking and analysing their weekly productions in their factories by scientific control, the company had been loyally and ably served by the central research laboratory at Epsom and by their chemical advisers.

At any moment they might be compelled, either alone or in association with others, to invest considerable sums in new installations which might only be profitable on large-scale production. Stockholders would therefore understand the necessity for the company holding substantial reserves and liquid funds against such contingencies. They would also appreciate the necessity for heavy deductions for depreciation and obsolescence.

The yeast trade for the past year had been well maintained, notwithstanding the severe home and foreign competition. The malt extract factory had been fully employed during the year, and the output showed an improvement on last year's figures. Here, as in the yeast trade, the competition had been keen and the margin of profit had accordingly become smaller.

Wood Flour for Industrial Uses

Nut-shell Powders of Many Types

WOOD flour made from softwoods is used as fillers by the makers of moulding powders for bakelite products (120, 100 and 80 mesh), linoleum manufacturers (80 mesh), jointless composition flooring firms (60 mesh) and by explosives manufacturing concerns (40 and 30 mesh). In the case of bakelite the wood flour, where dry moulding powders are made, must have a low moisture content, not over 7 per cent., and the natural resin content must be less than 1 per cent. Wood flour meeting these requirements is supplied by W. S. Dahl, who is also introducing from Sweden a pulverised bleached and unbleached white sulphite pulp (80/100 mesh) for which he anticipates a large demand from the bakelite and shoe industries. Among many other products, W. S. Dahl supplies boxwood sawdust from the South African and Russian boxwood trees for diamond setting, and wood flour for synthetic leather, as it contains tannin; also birch fibre flour for explosives factories, walnut, almond and Brazil nut-shell powders for fillers for hard and soft rubber compounds, bakelite, roof lining, etc. These nut powders make excellent gas absorbers for gas masks when carbonised.

New British Chemical Standard

Ni-Cr-Cu Austenitic Iron "L"

THE Bureau of Analysed Samples, Ltd., which has recently taken over from Ridsdale and Co., Ltd., the preparation and supply of British Chemical Standards, announces the issue of the second of a series of alloy cast irons containing special elements.

This standard analysed sample is typical of a type sometimes known as Ni-resist irons which are now being used both for electrical resistance grids and purposes for which high resistance to corrosion at ordinary temperatures and scaling and growth at high temperatures is essential. The standard sample presented more difficulties in analysis than was anticipated and should be useful to chemists who need more information about the accurate determination of high Ni-Cr and Cu and their effect on the determination of the ordinary elements in cast iron.

The standard turnings have been carefully analysed as usual by a number of experienced chemists representing the

different interests involved, *e.g.*, The British Cast Iron Research Association and users of this class of iron. The standardised figures are:—

	%		%
Total carbon ..	3.06	Phosphorus ..	0.119
Silicon	2.26	Nickel	13.45
Manganese.. ..	1.01	Chromium ..	3.96
Sulphur	0.031	Copper.. ..	4.73

This is probably the only standard of its kind in Great Britain and is therefore likely to be of interest to independent analysts, Government Departments and works chemists who are associated with the manufacture or use of alloy irons in the aviation, motor, engineering and electrical industries.

The standard is issued in bottles containing 500, 100, 50, and 25 grams each at a price which is estimated to cover the cost. Each bottle is provided with a certificate showing each chemist's analysis, together with an outline from Bureau of Analysed Samples, Ltd., or from any of the usual laboratory furnishers.

Letter to the Editor

A Bleaching Problem

SIR,—The rubber flooring manufacturers want a very white wood flour of fine mesh (180/200) and if possible bleached white; this, bakelite firms also want, especially for the light colours. The bleaching is almost impossible to do economically and satisfactorily and cannot compete with the bleached sulphite pulp. Bleaching wood flour is very much like bleaching a straw hat—you may get it white for the time being, but it is inclined to revert to its original colour after a time. The bleaching process is carried out by employing either chloride of calcium or sodium bisulphite, the former being in my opinion the better, but before using these chemicals all the lignin must be taken out of the wood, and after the bleaching is completed any acids or alkalies that may be left in the flour must be washed out or the moulding powder will be spoilt.

I shall be glad if any of your readers can tell me of a better, cheaper and more lasting process that would meet the needs of the various bakelite and rubber flooring manufacturing concerns.—Yours faithfully,

W. S. DAHL.

93 Cannon Street,
London, E.C.4.

Industrial Physicists

Their Personality and Training

THE Institute of Physics has just issued an account, by Professor J. A. Crowther, honorary secretary of the Institute, of the conference which was held recently on the training of industrial physicists. This discussion resulted in a very frank exchange of views between the heads of industrial research departments and university representatives.

It was not to be expected that unanimity could be attained on any of the topics raised. The employment of physicists in industry in appreciable numbers is of very recent growth, and it is natural that, until considerable further experience has been gained, there should be divergent opinions as to the best type of man and the best mode of training for industrial work. Some general points of interest, however, emerged, and some useful comments were made which are recorded in the published account. Moreover, it is evident that scope exists for a more intensive effort to educate the general public as to the meaning and content of physics, and the kind of work which can most properly be entrusted to the trained physicist.

The work of the physicist in industry falls into at least three categories: (a) fundamental or long-range research, the application of new discoveries, or novel and untried ideas to industrial purposes; (b) development work, including the rapid solution of small difficulties which arise from day to day in the factory, and the problems arising in exploiting laboratory technique and apparatus for use in industrial processes; (c) technical salesmanship.

It is particularly worth noting that almost every industrial speaker emphasised, very strongly, the importance of personality. The type of man required was one who could get on easy terms with his fellows, did not irritate by conscious or unconscious airs of superiority, could be friendly with foremen, and diplomatic with directors, and was prepared to study the art of putting his subject to the layman in a form in which it could be assimilated; in fact, as one speaker put it, the sort of man who would be made the captain of a team or the secretary of a club. Sheer intellectual ability is not likely to carry a man far in industrial work if it is not accompanied by those qualities of character which make him readily acceptable to his fellows.

Copies of Professor Crowther's account of the conference can be obtained, free of charge, from the Secretary, Institute of Physics, 1 Lowther Gardens, London, S.W.7.

A Non-Drying Paint

Unaffected by Water and Corrosive Fumes

INTRODUCED thirty years ago under the name of "Humidine," this unique non-setting, anti-corrosive paint is now being manufactured and supplied by Aspinalls (Paints), Ltd. The chief characteristic of this product is that it never dries, and does not crack or blister; in addition, it is unaffected by ammonia or acid fumes and therefore gives a superior type of coating for iron and steelwork which is exposed to corrosive conditions. When applied, it is claimed to "sink into the metal," that is, it gets behind the surface rust and thereby prevents creeping conditions of corrosion. By reason of its non-drying nature, the use of "Humidine" is naturally confined—broadly speaking—to the inside of the underside of metalwork, or to places (*e.g.*, water storage tanks or gas holders) which are not subject to physical contact. It is quite impervious to moisture, and can be applied in the rain or even under water. It is also non-poisonous and non-inflammable and may therefore be used in confined spaces in the presence of naked lights. Only one coat is needed, and supplies do not deteriorate when in store. Aspinalls (Paints), Ltd., are also the manufacturers of a rust-defeating paint known as "Rusdefya," which is expressly prepared for the protection and maintenance of structural steelwork of every description.

Physical Constants of Pure Metals

Data Published by National Physical Laboratory

A CONSIDERABLE number of physical constants of pure metals have been determined during the past fifteen years at the National Physical Laboratory, Teddington. The results have now been collected and are published in a pamphlet ("Physical Constants of Pure Metals," H.M. Stationery Office, 6d. net) in a convenient form for reference.

Part I contains data for some specially pure metals which have been prepared in the course of researches at the Laboratory. The metals are iron, chromium, manganese, beryllium, cadmium, magnesium and tin, and tables are also included, giving the surface tensions of liquid metals, and the lattice parameters of various metals. Part II contains results obtained on metals of known high purity procured from external sources. Data are given for melting points, latent heats of fusion, specific heats, thermal conductivities, and coefficients of expansion. The results of measurements made in orther institutions have, in many instances, been included, thus bringing together results which are later than those contained in the International Critical Tables.

Personal Notes

Mr. C. P. Finn has been appointed technical manager of Coking and By-Products, Ltd.

Mr. E. S. Edmiston has been appointed lecturer in industrial chemistry in the University of Queensland.

Mr. F. Rumford has been appointed lecturer in chemical engineering at the Royal Technical College, Glasgow.

Dr. A. G. Innes has resigned from the Controllership of the Chemical Department of the Egyptian Government and is now living at Northwood, Middlesex.

Mr. L. H. T. Walker, who has been doing experimental work at the Fuel Research Station, has been appointed a technical assistant under the State Electricity Commission of Victoria.

Mr. F. A. Willett, of the Economic League, gave an address on July 14 to 300 employees of F. W. Hampshire, Ltd., manufacturing chemists, of Derby.

Lord Trent unlocked the main door of the Jesse Boot School, Colwick Hill, Nottingham, on July 16, with a golden key presented to him by the city engineer, Mr. R. M. Finch. Reference was made to the work accomplished by Jesse Boot, particularly in the establishment of schools in connection with the famous firm.

Mr. Hubert Holliday managing director of the Vacuum Oil Co., Ltd., has completed 35 years' service with the company, and the occasion was celebrated at the Dorchester Hotel on Wednesday. As a souvenir of the occasion Mr. Holliday was presented with a gold dress watch and chain on behalf of the staff.

Mr. G. W. Riley has been elected to the board of George Scott and Son (London), Ltd.

Dr. P. Meyer is now chief chemist with the Arend Petroleum Mij., in the Dutch West Indies.

Mr. T. H. Harvey has been elected a director of the Distillers Co., Ltd. He is managing director of the United Yeast Co., Ltd.

Mr. George Booth Tate, of Bere Court, Pangbourne, Berks, a former member of the firm of Henry Tate and Sons, Ltd. (now Tate and Lyle, Ltd.), left gross estate of £565,225, with net personalty £547,702.

Alderman Daniel Hall, of Lynwood, Henrietta Street, Ashton-under-Lyne, director of Hall and Kay, Ltd., ventilating engineers, a member of the Ashton Town Council and mayor in 1932, left £17,307, with net personalty £16,716.

Miss Olga Lee Nierenstein, only daughter of Dr. and Mrs. Nierenstein, Bristol, was married on July 18, at St. Mary Magdalene, Stoke Bishop, Bristol, to Mr. John L. Murray, younger son of Mr. L. A. Morrison and the late Mrs. Morrison, Biggar, Lanarkshire.

Mr. Joseph Lollar, assistant shipping manager in Liverpool to Imperial Chemical Industries, Ltd., has died after a short illness. He leaves a widow and two sons. Mr. Lollar began his career in 1896 in the Liverpool office of Brunner, Mond and Co., and when this firm was incorporated with Imperial Chemical Industries, Ltd., in 1927 he was appointed assistant shipping manager. The funeral took place at Wallasey on Monday.

Chemical Notes from Foreign Services

Latvia

The Central Association of Latvian Co-operative Dairies announces an extension in artificial horn production, thus allowing of a surplus for export.

Poland

Synthetic rubber is now being produced from alcohol on an experimental scale and marketed under the name of "Ker," according to a recent lecture by Professor Smolenski. It is said to compare favourably with natural rubber in respect of durability and heat resistance although being slightly inferior in extensibility.

Belgium

Chemical developments in the Belgian Congo were mentioned in the report for 1935 of the Société Générale Industrielle et Chimique du Katanga. Work has commenced on a factory for electrolytic production of sodium chlorate, and glycerine manufacture from palm oil is now proceeding. A net profit of 32 million francs was achieved, out of which a dividend of 6 per cent. is being distributed.

France

Highly polished surfaces have been produced upon copper and some of its alloys by a method based upon anodic treatment of the metal in a concentrated aqueous solution of orthophosphoric or pyrophosphoric acid. The metal under treatment forms the anode and is immersed in the acid solution which is kept at a low temperature (15° to 25° C.) while the cathode is formed by a copper sheet with a larger surface area than that of the anode. Best results (according to a report in "L'Industrie Chimique," June, 1936) are obtained with a voltage in the vicinity of that required for gaseous evolution; if gas is evolved at 2.1 volts, for example, the optimum operating voltage is 1.9.

Holland

For the first time in three years a profit (33,000 florins) is announced for the 1935 trading year by N. V. Lijmen Gelatinefabriek "Delft." The demand for gelatine increased slightly during the latter half of the year.

Esthonia

Treatment of leprosy with dry ice has been found efficacious by Dr. Paldrock, of the University of Tartu, who has recorded destruction of the malignant tissue at the low temperature produced. The treatment is rendered more effctive by gold injections.

Spain

Anti-syphilitic chemicals of the arsenobenzol class are now made by the Bilbao works of Fabrica Espanola de Productos quimicos y farmaceuticos, S.A., under the brand names of Neo-Faes and Neo-Spirol. Arrangements have been made to subject them to clinical tests in comparison with imported arsenicals under the supervision of the Ministry of Health, a course which (according to a report in the "Chemische Industrie") will be followed whenever other Spanish firms offer anti-syphilitic preparations.

Switzerland

Recent company registrations include Holzverzuckerungs A.G., Zurich (capital 42,500 francs), manufacturers of sugar fermentation products, notably alcohol from wood; Ostrosol A.G., Lucerne (capital 1,000 francs), pharmaceutical products; "Cilag" Chemisches Industrielles Laboratorium, A.G., Schaffhausen (capital 5,000 francs), pharmaceutical products; Autopharm A.G., Olten (capital 10,000 francs), chemical and pharmaceutical preparations.

From Week to Week

THE COLOUR USERS' ASSOCIATION will hold its annual general meeting at Cromwell Buildings, Manchester, on July 28.

OIL COMPANIES supplying the Orkneys and Shetlands are to erect bulk oil depots at Lerwick and Kirkwall, as a result of the enforcement by the Board of Trade of regulations concerning the carriage of petrol spirit in barrels as deck cargo.

THE OFFICE OF MANAGEMENT ASSOCIATION is celebrating its coming-of-age this year, and has issued a booklet on its work. Mr. C. P. Holland, of Imperial Chemical Industries, Ltd., is one of the vice-presidents of the Association.

ST. NINIAN'S TALLOW AND CANDLE WORKS, St. Ninian's, Stirling, were partially destroyed by fire on Tuesday, the main part of the two-storey building, used as a candlemakers' works for 70 years, being gutted. The fire originated in the boiler-house and Stirling Fire Brigade succeeded in preventing the outbreak from attacking neighbouring premises. Tallow in the store room was also saved, but damage to the extent of £1,000 was caused.

ALL HOPES OF ESTABLISHING STEELWORKS at Jarrow-on-Tyne have now been abandoned following the announcement in the House of Commons by Mr. Walter Runciman, President of the Board of Trade, that the project would not be an economic proposition. The Town Council, however, has noted Mr. Runciman's statement regarding coal-oil works and at a private meeting the Council decided to demand that new works including a coal-oil plant at Jarrow. The bitterest disappointment was expressed by members of the Council at a town's meeting when the Mayor (Alderman J. W. Thompson) said the Council had been misled and in future they would not depend on promises.

IN THE CHANCERY DIVISION, on July 21, Mr. Justice Farwell sanctioned the reduction by two-thirds of the capital of the Newton Abbot Clays, Ltd., whose registered office is at Tregarne Terrace, St. Austell, Cornwall, a company established in 1919 to carry on the business of producers of and dealers in ball clays, pipe clays, china clays and other kinds of clay. Mr. Armitage, for the company, explained that its capital was £35,000, and the reduction was of capital not represented by available assets. Certain land purchased experimentally had not yielded to the test's promise of being worked at a profit, so that it had to be treated as of agricultural value. The capital would be reduced to £11,666 (divided into 34,850 ordinary shares of 6s. 8d. each and 3,000 founders' shares of 4d. each), and the reduction would be effected by cancelling capital to the extend of 13s. 4d. per share on each of the 31,380 issued ordinary shares and 8d. on each of the 3,000 founder shares, and by reducing the nominal amount of the ordinary shares from £1 to 6s. 8d. and of all founders' shares from 1s. to 4d. per share. On the reduction taking effect, the capital would be increased to its former amount of £35,000 by the creation of 70,000 new ordinary shares of 6s. 8d. each.

THE QUESTION OF THE RENEWAL of the Safeguarding of Industries (Exemption) No. 7 Order, 1935, No. 1 Order, 1936, No. 2 Order, 1936, No. 5 Order, 1936, and No. 8 Order, 1936, made under Section 10 (5) of the Finance Act, 1926, is now under consideration by the Board of Trade. The articles covered by these Orders, which exempt them from key industry duty until August 19, comprise certain scientific instruments, vacuum tubes, compounds of rare earth metals, synthetic organic chemicals, analytical reagents, other fine chemicals and chemicals manufactured by fermentation processes, amorphous carbon electrodes and vanadium compounds. The complete list was published in the "Board of Trade Journal" of July 24. Communications should be addressed to the Principal Assistant Secretary, Industries and Manufactures Department, Board of Trade, Great George Street, London, S.W.1, not later than July 31.

THE FORMATION IS ANNOUNCED of the Lead Industries Development Council. This marks a further stage in the progressive co-operation which has been a feature of recent years between the manufacturers of white lead, red lead, sheet lead and lead pipes and the lead mining and smelting organisations operating within the Empire. The increasing uses of lead have made it desirable that an organisation should be set up which is in a position to give authoritative information on the subject and to promote new and improved methods of using lead and its products. These will be the principal functions of the Council, which will absorb and co-ordinate the separate organisations hitherto maintained in the United Kingdom for similar purposes by the white lead manufacturers and the sheet lead and lead pipe manufacturers. The new body is sponsored by the whole of the lead products manufacturing industry as well as by the Empire lead mining and smelting companies. The members of the Lead Industries Development Council include representatives of the lead manufacturers and of the Empire mining and smelting interests, and the chairman is Mr. H. S. Tasker, managing director of Associated Lead Manufacturers, Ltd. Mr. Roger Hodgson has been appointed secretary to the Council, whose address will be Rex House, 38 King William Street, London, E.C.4.

THE NAME of Silical Water Softeners, Ltd., 27 Moor Lane, E.C.2, has been changed to Silical Water Softeners (Domestic), Ltd.

THE NOMINAL CAPITAL of Bovall (Sales), Ltd., Carlton House, Regent Street, London, W.1, has been increased by the addition of £4,000 beyond the registered capital of £1,000.

THE POLISH FINANCIAL INTERESTS closely connected with the Government which recently acquired the controlling block of shares in the German-owned Interessen Gemeinschaft, the largest steel and iron foundry and coal mines in Polish Upper Silesia, has proposed to the creditors a 40 per cent. payment on the debts. The large creditors are mainly German banks.

THE COUNCIL of the Institution of Chemical Engineers hopes to arrange for one or more "members' meetings" to be held in addition to the ordinary programme of meetings for next session. The object of these meetings, which will be informal, is to afford opportunities for members to bring forward short papers, which could not sustain a full evening's discussion.

TRIPLEX (NORTHERN), LTD., an associate company of the Triplex Safety Glass Co., Ltd., has acquired H. E. Ashdown of Birmingham, a private company which manufactures moulded products, including mouldings for the motor trade. Triplex Safety Glass Co. holds 49 per cent. of the capital of Triplex (Northern), Ltd.

FOR THE FIRST TIME BRITAIN has become independent of Germany in the provision of glass for artificial eyes. In co-operation with the Department of Industrial and Scientific Research, and the British Scientific Instrument Research Association, the Ministry of Pensions have produced a formula from which a British firm is able to make a glass possessing practically all the qualities of the German glass, and capable of receiving the many tints which are to be found in the human eye. In addition, the new British glass can be manufactured on a commercial scale at a cost which is less than the price paid to the Germans. About 4,000 glass eyes are supplied yearly in Great Britain to over 8,000 ex-service men who lost either one or both eyes in the war period 1914-18.

BEFORE SOCIAL PHENOMENA can be understood they must be measured. The means of measurement are provided by the multitudinous statistics now available on all kinds of subjects; among these a leading place is taken by the hundreds of volumes produced every year at the taxpayers' expense. This immense body of material cannot be utilised to the best advantage without the aid of an alphabetical index which arranges the statistics under subject headings and indicates the time and place to which they relate and the degree of detail in which they are analysed. It is for this purpose that the "Guide to Current Official Statistics" is prepared every year under the auspices of a standing committee of Government statisticians. Volume 14 of this handbook, which relates to the official statistics published in 1935, has just been published. It contains 365 pages, and is obtainable from the sale offices of H.M. Stationery Office, or through any bookseller, for one shilling (by post 1s. 5d.).

IN THE COURT OF APPEAL on Wednesday, before the Master of the Rolls and Lords Justices Romer and Greene, British Celanese, Ltd., of Sponden, Derbyshire, appealed against a decision of Mr. Justice Clauson, in the Chancery Division, dismissing its action against the British Acetate Silk Corporation, Ltd., of Stowmarket, Suffolk, and others, alleging infringement of patents relating to the spinning of artificial silk. The action originally related to five patents, but three of these were declared invalid in previous litigation with Courtaulds, and the claims in respect of these were not pursued. The other two were described as "pump" and "funnel" patents. The defendants denied infringement, and alleged that the patents were invalid. The hearing was adjourned.

THE CHINA CLAY STATISTICS FOR JUNE were not as heavy as they were in May by nearly 8,000 tons, yet notwithstanding they mark an advance of 6,000 tons for a similar period last year and a favourable balance of 28,000 tons when the first half year is compared with 1935. In all sections china clay, china stone and ball clay the improvement is more significant as the advance of the past six months is over 39,000 tons above last year and 41,000 tons in 1934. The recovery has been gradual and there is every prospect of a continuance. There is sure to be a big demand for potting clays, china stone and ball clays between now and the Coronation, because of the making of Coronation mugs and other mementos of the great national observance. Details of shipments in June were:—Fowey, 39,756 tons china clay, 2,150 tons china stone, 1,943 tons ball clay; Par, 8,296 tons china clay, 92 tons china stone; Charlestown, 3,103 tons china clay; Padstow, 867 tons china clay; Newham, 97 tons china clay; Plymouth, 112 tons china clay; by rail entirely, 4,868 tons china clay; making a total for the month of 61,604 tons, against 57,337 tons in June, 1935.

Weekly Prices of British Chemical Products

THERE are no outstanding price changes to report in the general market for heavy chemicals, wood distillation products, perfumery chemicals, essential oils and intermediates. In the coal tar products market the prices of all grades of cresylic acid have been advanced.

LONDON.—Prices remain steady in the London chemical market, and there is a good general demand for most products.

MANCHESTER.—Except that deliveries of both heavy and light chemicals to certain districts in Lancashire and West Yorkshire have been unfavourably affected in consequence of holidays there has been little important change in conditions on the Manchester market during the past week. Apart from the factor mentioned, specifications for supplies against contract commitments are circulating satisfactorily and fair quantities are being taken up, with textile chemicals in particular showing a slight but welcome improvement. New buying during the past week, however, has been on no more than a moderate scale. The market as a whole is on a steady basis, and in the case of the by-products, whilst here and there a certain amount of easiness has been in evidence values generally have been well maintained.

GLASGOW.—There has been a steady demand for general chemicals for home trade during the week, and also rather more inquiry for export. Prices generally continue quite firm at about previous figures with no important changes to report. Our coal tar products market reporter records that works have been more or less at a standstill since last Friday on account of the Glasgow Fair holiday. Apart from minor deliveries from stock there has been very little business transacted. The chief feature of the market is cresylic acid, which remains in firm demand. Some further contracts have been placed for forward delivery, and there is no sign of prices slackening. Oils of high cresylic acid content find a ready enough market, but other oils show little tendency to move. Outside the Association supplies of benzol are limited. Some interest is being expressed in a report, from a reliable source, that a new benzol plant is to start up in August at one of the city gasworks.

Price Changes

Rubber Chemicals.—VERMILION, pale or deep, 4s. 6d. per lb.

Coal Tar Products.—CRESYLIC ACID, 97/99%, 2s. 10d. to 2s. 11d. per gal.; pale, 98%, 3s. to 3s. 1d.; dark, 2s. 4d. to 2s. 5d.; pale, 99/100% (Glasgow), 2s. 8d. to 2s. 10d. per gal.; high boiling acids (Glasgow), 1s. 9d. to 2s. 3d. per gal. NAPHTHALENE, crude, whizzed or hot pressed, £16 10s. per ton.

Pharmaceutical and Photographic Chemicals.—ATROPINE SULPHATE, 14s. 5d. to 14s. 11d. per oz.; METHYL SALICYLATE, 1s. 1½d. to 1s. 3d. per oz.

General Chemicals

ACETONE.—LONDON: £62 to £65 per ton; SCOTLAND: £64 to £65 ex wharf, according to quantity.

ACID, ACETIC.—40% technical, £16 12s. 6d. per ton. LONDON: Tech., 80%, £30 5s. to £32 5s. per ton; pure 80%, £32 5s. to £34 5s.; tech., 40%, £16 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £32 5s.; tech., 80%, £30 5s., d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £30 5s.; tech. glacial, £48 to £50.

ACID, BORIC.—Commercial granulated, £27 per ton; crystal, £28; powdered, £29; extra finely powdered, £31; packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. B.P. cryst., £36; B.P. powder, £37. SCOTLAND: Crystals, in 1 cwt. bags, £28; powdered, in 1 cwt. bags, £29.

ACID, CHROMIC.—Flaked, 10d. per lb., less 2½%; ground, 10¼d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—1s. per lb. MANCHESTER: 1s. SCOTLAND: B.P. crystals, 1s. per lb. less 5%.

ACID, CRESYLIC.—97/100%, pale, 2s. 10d. to 2s. 11d. per gal; 99/100%, refined, 3s. to 3s. 4d. per gal. LONDON: 98/100%, 1s. 5d. f.o.r.; dark, 1s.

ACID, FORMIC.—LONDON: £42 to £47 per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works. SCOTLAND: 80°, £24 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: £2 10s. per cwt. in casks. MANCHESTER: £49 to £55 per ton ex store.

ACID, SULPHURIC.—SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—1s. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. LONDON: 11¼d., less 5%. SCOTLAND: 11¾d. less 5%. MANCHESTER: 1s. per lb.

ALUM.—SCOTLAND: Ground, £10 2s. 6d. per ton; lump, £9 12s. 6d.

ALUMINA SULPHATE.—LONDON: £7 10s. to £8 per ton. SCOTLAND: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—SCOTLAND: Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—LONDON: Fine white crystals, £18 to £19. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

AMMONIUM SULPHATE.—Neutral quality, 20.6% nitrogen, £7 per ton.

ANTIMONY OXIDE.—SCOTLAND: £61 to £65 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden, 6½d. to 1s. 1d. per lb.; crimson, 1s. 5½d. to 1s. 7d. per lb., according to quality.

ARSENIC.—LONDON: £13 10s. per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines. SCOTLAND: White powdered, £18 ex store. MANCHESTER: White powdered Cornish £20 10s. ex store.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—LONDON: £10 10s. per ton. SCOTLAND: £11.

BARYTES.—£6 10s. to £8 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot, 35/37%, £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £9.

BORAX, COMMERCIAL.—Granulated, £14 10s. per ton; crystal, £15 10s.; powdered, £16; finely powdered, £17; packed in 1-cwt. bags, carriage paid home to buyer's premises within the United Kingdom in 1-ton lots. SCOTLAND: Granulated, £14 10s. per ton in 1 cwt. bags, carriage paid.

CADMIUM SULPHIDE.—3s. 10d. to 4s. 1d. per lb.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums. SCOTLAND: £5 10s. per ton net ex store.

CARBON BISULPHIDE.—£31 to £33 per ton, drums extra.

CARBON BLACK.—3¾d. to 4¾d. per lb. LONDON: 4¼d. to 5d.

CARBON TETRACHLORIDE.—SCOTLAND: £41 to £43 per ton, drums extra.

CHROMIUM OXIDE.—10¾d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 2⅝d. per lb.; liquor, £19 10s. per ton d/d

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—£3 19s. per cwt. less 2½%. LONDON: £3 17s. per cwt. SCOTLAND: £3 18s. net.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £24 10s. per ton. SCOTLAND: 40%, £25 to £28 ex store.

IODINE.—Resublimed B.P., 6s. 3d. to 8s. 4d. per lb.

LAMPBLACK.—£26 to £28 per ton.

LEAD ACETATE.—LONDON: White, £33 15s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £34 to £35; brown, £1 per ton less. MANCHESTER: White, £34, brown £33.

LEAD NITRATE.—£32 10s. to £34 10s. per ton.

LEAD, RED.—SCOTLAND: £31 per ton less 2½%, carriage paid.

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: £41.

LITHOPONE.—30%, £16 5s. to £16 10s. per ton.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—SCOTLAND: £6 17s. 6d. per ton.

MAGNESIUM SULPHATE.—Commercial, £5 per ton, ex wharf.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

PARAFFIN WAX.—SCOTLAND: 3⅝d. per lb.

PHENOL.—6¾d. to 7½d. per lb.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £39.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. less 5%, d/d U.K. Ground, 5¼d. LONDON: 5d. per lb. less 5%, with discounts for contracts. SCOTLAND: 5d. per lb. less 5% carriage paid. MANCHESTER: 5d.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 4½d. per lb. MANCHESTER: £38 per ton.
POTASSIUM CHROMATE.—6½d. per lb. d/d U.K.
POTASSIUM IODIDE.—B.P., 5s. 2d. per lb.
POTASSIUM NITRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.
POTASSIUM PERMANGANATE.—LONDON: 8¼d. per lb. SCOTLAND: B.P. Crystals, 8¾d. MANCHESTER: B.P. 11d.
POTASSIUM PRUSSIATE.—LONDON: Yellow, 7½d. to 8d. per lb. SCOTLAND: 7½d. net, ex store. MANCHESTER: Yellow, 8¼d. to 8½d.
SALAMMONIAC.—First lump spot. £41 17s. 6d. per ton d/d in barrels. SCOTLAND: Large crystals, in casks, £36.
SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r. in bags.
SODA, CAUSTIC.—Solid, 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 12s. 6d. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.
SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.
SODIUM ACETATE.—LONDON: £21 per ton. SCOTLAND: £17 15s. per ton net ex store.
SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: £12 10s. per ton in 1 cwt. kegs, £10 15s. per ton in 2 cwt. bags. MANCHESTER: £10 10s.
SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount 5%. Anhydrous, 5d. per lb. LONDON: 4d. per lb. less 5% for spot lots and 4d. per lb. with discounts for contract quantities. MANCHESTER: 4d. per lb. SCOTLAND: 4d., less 5% carriage paid.
SODIUM BISULPHITE POWDER.—60/62%, £20 per ton d/d 1 cwt. iron drums for home trade.
SODIUM CARBONATE, MONOHYDRATE.—£15 per ton d/d in minimum ton lots in 2 cwt. free bags. Soda crystals, SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality, 7s. 6d. per ton extra. Light Soda Ash, £7 ex quay, min. 4-ton lots with reductions for contracts.
SODIUM CHLORATE.—£29 per ton. SCOTLAND: £1 10s. per cwt.
SODIUM CHROMATE.—4d. per lb. d/d U.K.
SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10 5s.; photographic, £14 10s.
SODIUM IODIDE.—B.P., 6s. per lb.
SODIUM METASILICATE.—£14 per ton, d/d U.K. in cwt. bags.
SODIUM NITRITE.—LONDON: Spot, £18 5s. to £20 5s. per ton d/d station in drums.
SODIUM PERBORATE.—10%, 9¼d. per lb. d/d in 1-cwt. drums. LONDON: 10d. per lb.
SODIUM PHOSPHATE.—£13 per ton.
SODIUM PRUSSIATE.—LONDON: 5d. to 5¼d. per lb. SCOTLAND: 5d. to 5¾d. ex store. MANCHESTER: 5d. to 5¼d.
SODIUM SILICATE.—140° Tw. Spot, £8 per ton. SCOTLAND: £8 10s.
SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d SCOTLAND: English material, £3 15s.
SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 12s. 6d. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 2s. 6d. to £3 5s.
SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 7s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid, 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8.
SODIUM SULPHITE.—Pea crystals, spot, £13 10s. per ton d/d station in kegs. Commercial spot, £8 15s. d/d station in bags.
SULPHATE OF COPPER.—MANCHESTER: £15 per ton f.o.b. SCOTLAND: £16 10s. per ton less 5%.
SULPHUR.—£9 to £9 5s. per ton. SCOTLAND: £8 to £9.
SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.
SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.
VERMILION.—Pale or deep, 4s. 6d. per lb. in 1-cwt. lots.
ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.
ZINC SULPHATE.—LONDON: £12 per ton. SCOTLAND: £10 10s.
ZINC SULPHIDE.—10d. to 11d. per lb.

Coal Tar Products

ACID, CRESYLIC.—97/99%, 2s. 10d. to 2s. 11d. per gal.; 99/100%, 3s. to 3s. 6d. per gal., according to specification; pale 98%, 3s. to 3s. 1d.; dark, 2s. 4d. to 2s. 5d. LONDON: 98/100% 1s. 4d.; dark, 95/97%, 1s. GLASGOW: Pale, 99/100%, 2s. 8d. to 2s. 10d. per gal.; pale, 97/99%, 2s. 2d. to 2s. 4d.; dark, 97/99%, 2s. to 2s. 1d.; high boiling acids, 1s. 9d. to 2s. 3d.; American specification, 2s. 6d. to 2s. 9d.
ACID, CARBOLIC.—Crystals, 6¾d. to 7¾d. per lb.; crude, 60's, 2s. 3d. to 2s. 6d. per gal. MANCHESTER: Crystals, 6¾d. per lb.; crude, 2s. 6d. to 2s. 7d. per gal. GLASGOW: Crude, 60's, 2s. 4d. to 2s. 6d. per gal.; distilled, 60's, 2s. 8d. to 3s.
BENZOL.—At works, crude, 8½d. to 9d. per gal.; standard motor 1s. 2d. to 1s. 2½d.; 90%, 1s. 3d. to 1s. 3½d.; pure, 1s. 7d. to 1s. 7½d. LONDON: Motor, 1s. 3½d. GLASGOW: Crude, 8½d. to 9d. per gal.; motor, 1s. 3d. to 1s. 4d.
CREOSOTE.—B.S.I. Specification standard, 5½d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 4½d. f.o.r. North; 5d. London. MANCHESTER: 4¾d. to 5¼d. GLASGOW: B.S.I. Specification, 5¼d. to 5⅜d. per gal.; washed oil, 4½d. to 5d.; lower sp. gr. oils, 4¾d. to 5d.
NAPHTHA.—Solvent, 90/100%, 1s. 5½d. to 1s. 6½d. per gal.; 95/160%, 1s. 8d.; 90%, 1s. to 1s. 2d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. GLASGOW: Crude, 5½d. to 6d. per gal.; 90% 160, 1s. 4d. to 1s. 5d.; 90% 190, 1s. to 1s. 1d.
NAPHTHALENE.—Crude, whizzed or hot pressed, £16 10s. per ton; purified crystals, £25 per ton in 2-cwt. bags. LONDON: Fire lighter quality, £5 to £5 10s. per ton; crystals, £27 to £27 10s. GLASGOW: Fire lighter, crude, £7 to £8 per ton (bags free).
PYRIDINE.—90/140%, 5s. to 7s. per gal.; 90/180, 2s. 3d. GLASGOW: 90% 140, 6s. to 6s. 6d. per gal.; 90% 160, 5s. to 5s. 6d.; 90% 180, 2s. 6d.
TOLUOL.—90%, 2s. per gal.; pure, 2s. 4d. GLASGOW: 90% 120, 1s. 11d. to 2s. per gal.
XYLOL.—Commercial, 2s. 1d. per gal.; pure, 2s. 3d. GLASGOW: Commercial, 2s. to 2s. 1d. per gal.
PITCH.—Medium, soft, 35s. to 36s. per ton, in bulk at makers works. MANCHESTER: 32s. 6d. f.o.b., East Coast. GLASGOW: f.o.b. Glasgow, 32s. 6d. to 35s. per ton; in bulk for home trade, 32s. 6d.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—July, £7 5s. per ton; August, £6 14s. 6d.; September, £6 16s.; October, £6 17s. 6d.; November, £6 19s.; December, £7 0s. 6d. for neutral quality basis 20.6% nitrogen delivered in 6-ton lots to farmer's nearest station. MANCHESTER: Brown, £9; grey, £10 10s.
CALCIUM CYANAMIDE.—August, £6 15s. per ton; September, £6 16s. 3d.; October, £6 17s. 6d.; November, £6 18s. 9d.; December, £7: carriage paid to any railway station in Great Britain in lots of 4 tons and over.
NITRO-CHALK.—£7 5s. per ton to end of September.
NITRATE OF SODA.—£7 12s. 6d. per ton to end of September.
CONCENTRATED COMPLETE AND AMMONIUM PHOSPHATE FERTILISERS.—Prices have not yet been fixed and at present it is impossible to give any indication as to the date of any announcement or of the trend of prices.

Wood Distillation Products

ACETATE OF LIME.—Brown, £8 to £8 10s. per ton; grey, £10 5s. to £10 15s. Liquor, brown, 30° Tw., 8d. per gal. MANCHESTER: Brown £9; grey £10 10s.
CHARCOAL.—£5 to £10 per ton, according to grade and locality.
METHYL ACETONE.—40-50%, £45 to £48 per ton.
WOOD CREOSOTE.—Unrefined 6d. to 1s. 6d. per gal., according to boiling range.
WOOD, NAPHTHA, MISCIBLE.—2s. 9d. to 3s. 3d. per gal.; solvent, 3s. 9d. per gal.
WOOD TAR.—£2 to £2 10s. per ton.

Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9¼d. per lb.
ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.
ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.
ACID NAPHTHIONIC.—1s. 8d. per lb.
ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100%.
ACID, SULPHANILIC.—Spot, 8d. per lb. 100%, d/d buyer's works.
ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.
ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.
o-CRESOL 30/31° C.—6d. per lb. in 1-ton lots.
p-CRESOL 34-5° C.—1s. 6d. per lb. in ton lots.
m-CRESOL 98/100%.—1s. 7d. per lb. in ton lots.
DICHLORANILINE.—1s. 11½d. to 2s. 3d. per lb.
DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.
DINITROBENZENE.—8d. per lb.
DINITROTOLUENE.—48/50° C., 9d. per lb.; 66/68° C., 10½d.
DINITROCHLORBENZENE, SOLID.—£72 per ton.
DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.
α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.
β-NAPHTHOL.—In bags, £88 15s. per ton; in casks, £89 15s.
α-NAPHTHYLAMINE.—Lumps, 1s. per lb.; ground, 1s. 0½d.
β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb., d/d buyer's works.
o-NITRANILINE.—3s. 11d. per lb.
m-NITRANILINE.—Spot, 2s. 7d. per lb., d/d buyer's works.
p-NITRANILINE.—Spot, 1s. 8d. per lb., d/d buyer's works.
NITROBENZENE.—Spot, 4½d. to 5d. per lb.; 5-cwt. lots, drums extra.
NITRONAPHTHALENE.—9d. per lb.; P.G., 1s. 0½d. per lb.
SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.
o-TOLUIDINE.—9½d. to 11d. per lb.
p-TOLUIDINE.—1s. 11d. per lb.

(For latest oil prices see page 90.)

Inventions in the Chemical Industry

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Specifications Open to Public Inspection

SYNTHESIS OF CHEMICAL ELEMENTS.—Neutron Soc. Anon. Jan. 7, 1935. 7970/35.

APPARATUS FOR THE SEPARATION OF DUST from, and/or the purification of gases by washing.—Ateliers J. Hanrez Soc. Anon. Jan. 12, 1935. 33136/35.

AMMONIUM NITRATE IN GRANULAR FORM.—E. I. du Pont de Nemours and Co. Jan. 10, 1935. 33665/35.

PRODUCTION OF TERPINEOL FROM PINENE.—Hercules Powder Co. Jan. 9, 1935. 34263/35.

MANUFACTURE OF SULPHUR DYESTUFFS.—I. G. Farbenindustrie. Jan. 12, 1935. 199/36.

MANUFACTURE OF VAT DYESTUFFS.—I. G. Farbenindustrie. Jan. 12, 1935. 290/36.

SYNTHETIC TANNING AGENTS.—J. R. Geigy, A.-G. Jan. 12, 1935. 379/36.

CLARIFYING WATER such as industrial and town waste water.—Buckau R. Wolf Maschinenfabrik. Jan. 8, 1935. 475/36.

WASHING INDUSTRIAL GASES.—Ruhrchemie, A.-G. Jan. 11, 1935. 684/36.

CARBOCYANINE DYESTUFFS.—N. V. Gevaert Photo-Production. Jan. 8, 1935. 697/36.

CHEMICALLY-RESISTANT OIL COLOUR PAINTS.—G. Ruth, A.-G. Jan. 9, 1935. 722/36.

Specifications Accepted with Date of Application

SYNTHETIC RESINS of the urea formaldehyde type.—Bakelite, Ltd. Nov. 7, 1933. 449,898.

MANUFACTURE OF COMBUSTIBLE GASES from solid carbonaceous materials.—H. Dreyfus. Jan. 4, 1935. 450,092.

LYOPHILIC BIOLOGICALLY ACTIVE SUBSTANCES.—Sharp and Dohme, Inc. Jan. 31, 1934. 450,147.

MANUFACTURE OF TETRA ALKYL LEAD.—W. W. Triggs (E. I. du Pont de Nemours and Co.). Jan. 5, 1935. 450,152.

WET PURIFICATION OF GASES.—G. Nonhebel, J. L. Pearson, and Imperial Chemical Industries, Ltd. Jan. 7, 1935. 449,956.

HYDROGENATION OF RUBBER.—E. I. du Pont de Nemours and Co. Jan. 5, 1934. 449,957.

MANUFACTURE OF METAL COATED MATERIALS.—E. I. du Pont de Nemours and Co. Jan. 6, 1934. 449,958.

MONOAZO PIGMENTS for the colouring of rubber.—Imperial Chemical Industries, Ltd., W. G. Reid, and W. A. Sexton. Jan. 8, 1935. 450,021.

ARTIFICIAL FIBRES FOR SPINNING.—W. W. Groves (I. G. Farbenindustrie). Jan. 8, 1935. 450,216.

MEANS FOR KEEPING CUT FLOWERS and the like fresh.—Coutts and Co., and F. Johnson (legal representatives of J. Y. Johnson (deceased)). (I. G. Farbenindustrie). Jan. 9, 1935. (Addition to 332,278.) 449,960.

MANUFACTURE OF AZO DYESTUFFS.—I. G. Farbenindustrie. Feb. 22, 1934. 450,099.

MANUFACTURE OF A BLOOD-SUGAR REDUCING SUBSTANCE from urine.—A. Carpmael (I. G. Farbenindustrie). Jan. 9, 1935. 450,100.

MANUFACTURE OF CONDENSATION PRODUCTS.—I. G. Farbenindustrie. Jan. 9, 1935. 450,218.

RECOVERY OF SULPHUR.—Coutts and Co., and F. Johnson (legal representatives of J. Y. Johnson (deceased)). (I. G. Farbenindustrie). Jan. 10, 1935. 449,911.

FINISHING OF METALLIC SURFACES.—American Chemical Paint Co. Sept. 13, 1934. 450,164.

SOLUTIONS OF CELLULOSE DERIVATIVES IN ORGANIC SOLVENTS.—J. O. Hughes. Jan. 14, 1935. 450,168.

PRODUCTION OF SOLUTIONS of cellulose derivatives in organic solvents. J. O. Hughes, and T. R. Thomas. Jan. 14, 1935. 450,169.

SEPARATION OF SOLID INORGANIC AND/OR ORGANIC CONSTITUENTS from oils containing the same. Coutts and Co., and F. Johnson (legal representatives of J. Y. Johnson (deceased)). (I. G. Farbenindustrie). Jan. 30, 1935. 450,107.

RECOVERY OF VOLATILE SOLVENTS used in the manufacture of films and foils.—G. Frenkel. March 18, 1935. 449,923.

PROCESS FOR MAKING SODIUM SULPHIDE from sodium sulphate by reduction with hydrogen or other reducing gases.—A. Zieren. May 25, 1934. 449,935.

N-SUBSTITUTED AMIDES of the pyridine carboxylic acids.—K. Fricker. Aug. 4, 1934. 450,051.

SEPARATION OF LIQUIDS from solids by means of presses.—F. S. Carver. June 28, 1935. 449,940.

PURIFYING ZIRCON.—W. W. Triggs (Titanium Alloy Manufacturing Co.). July 10, 1935. 450,053.

DYEING PROCESSES.—R. Beyer Industrial Inventions, Ltd. (R. Beyer). Aug. 19, 1935. 450,198.

CONTINUOUS PRODUCTION OF METALLIC MAGNESIUM.—I. G. Farbenindustrie. Dec. 14, 1934. 450,064.

MANUFACTURE OF AZO DYESTUFFS.—J. R. Geigy, A.-G. Nov. 5, 1934. 450,127.

NITRO-AZO-DYESTUFFS containing metal.—I. G. Farbenindustrie. Nov. 6, 1934. 450,128.

Applications for Patents

(July 9 to 15 inclusive.)

OXIDATION OF INORGANIC SUBSTANCES.—J. Aitken. 19351.

PRODUCTION OF POLYMERIC ESTERS of acrylic acid series.—H. J. Barrett. 19463.

MANUFACTURE OF ANTHRAQUINONE DERIVATIVES.—A. Carpmael (I. G. Farbenindustrie). 19173.

MANUFACTURE OF WATER-SOLUBLE MINERAL ACID derivatives of hydroaromatic alcohols.—A. Carpmael (I. G. Farbenindustrie). 19452.

MANUFACTURE OF DERIVATIVES of substituted succinic acids.—A. Carpmael (I. G. Farbenindustrie). 19453.

DISTILLATION, ETC., OF COAL.—T. M. Davidson. 19238.

PRODUCTION OF METALLIC ZINC.—(Germany, July 23, '35.) C. P. Debuch. 19432.

MANUFACTURE OF HALOGENATED COMPOUNDS.—C. E. Dent, Imperial Chemical Industries, Ltd., and W. A. Silvester. 19590.

MANUFACTURE OF BUTYL ALCOHOL, ETC.—(Germany, July 13, '35.) Deutsche Gold-und Silber-Scheideanstalt vorm. Roessler. 19467.

PRODUCTION OF ORGANIC COMPOUNDS.—H. Dreyfus. 19411.

MANUFACTURE OF ALIPHATIC COMPOUNDS.—H. Dreyfus, L. Fallows. 19412.

CELLULOSE DERIVATIVE EMULSIONS.—E. I. du Pont de Nemours and Co. (United States, Aug. 15, '35.) 19242.

PRODUCTION OF POLYMERIC ESTERS of acrylic acid series.—E. I. du Pont de Nemours and Co. 19463.

MANUFACTURE OF ORGANIC ACIDS, ETC.—E. I. du Pont de Nemours. (United States, July 13, '35.) 19464.

TREATMENT OF CELLULOSE NITRATE.—(United States, July 13, '35.) E. I. du Pont de Nemours and Co. 19465.

PRODUCTION OF ALYALI CELLULOSE, ETC.—E. I. du Pont de Nemours and Co., F. C. Hahn. 19589.

MANUFACTURE OF POLYCARBOXYLIC ACID chlorides of benzene series.—W. W. Groves (I. G. Farbenindustrie). 19547.

PRODUCTION OF ACYL-DERIVATIVES of dihydro-oestrin.—B. Kondstantin-Hansen. 19587.

MANUFACTURE OF DERIVATIVES OF 2:4-dioxotetrahydro-pyridine.—F. Hoffman-La Roche and Co., A.-G. (Germany, Aug. 28, '35.) 19525.

PRODUCTION OF SOLUTIONS of cellulose derivatives, etc.—C. Hollins, Imperial Chemical Industries, Ltd. 19241.

PRODUCTION OF AMINO COMPOUNDS.—I. G. Farbenindustrie. (Germany, Nov. 28, '35.) 19274.

MANUFACTURE OF GLUCOSIDES.—I. G. Farbenindustrie. (Germany, July 12, '35.) 19379.

MANUFACTURE, ETC., OF AMINO COMPOUNDS.—I. G. Farbenindustrie. 19413.

MANUFACTURE OF BOROSILICATE GLASSES highly resistant to alkaline liquids.—Jenaer Glaswerk Schott and Gen. (Germany, July 22, '35.) 19030.

PRODUCTION OF COLOURED COMPOUNDS capable of indicating temperatures.—G. W. Johnson (I. G. Farbenindustrie). 19245.

MANUFACTURE, ETC., OF N- substituted aspartic acids.—G. W. Johnson (I. G. Farbenindustrie). 19414.

MANUFACTURE, ETC., OF NITROGENOUS CONDENSATION PRODUCTS.—G. W. Johnson (I. G. Farbenindustrie). 19415.

PRODUCTION, ETC., OF DYESTUFFS.—G. W. Johnson (I. G. Farbenindustrie). 19417.

ARTIFICIAL RESINS.—G. W. Johnson (I. G. Farbenindustrie). 19418.

PRODUCTION OF COMPOUNDS of the perylene series.—G. W. Johnson (I. G. Farbenindustrie). 19419.

MANUFACTURE, ETC., OF OXIDATION PRODUCTS from paraffin hydrocarbons of high molecular weight.—G. W. Johnson (I. G. Farbenindustrie). 19560.

MANUFACTURE OF LIQUID HYDROCARBONS, ETC., from mixtures of carbon monoxide and hydrogen.—G. W. Johnson (I. G. Farbenindustrie). 19561.

DISTILLATION OF HIGH-BOILING HYDROCARBONS TO COKE.—W. Mohring. (Germany, June 20.) 19430.

PROCESS FOR DEPURATION O F SYNTHETIC CAMPHOR.—Montecatini Soc. Generale per l'Industria Mineraria and Agricola. (Italy, July 15, '35.) 19647.

PROCESS FOR DE-ACIDIFYING LIQUIDS.—Permutit, A.-G. (Germany, July 27, '35). 19226.

MANUFACTURE OF UNSATURATED NEUTRAL OXIDATION PRODUCTS of sligmasteral compounds.—Schering-Khalbaum, A.-G. (Germany, July 13, '35). 19456.

MANUFACTURE OF INDIGOID DYESTUFFS.—Soc. of Chemical Industry in Basle. (Switzerland, July 10, '35.) 19165; (Switzerland, Oct. 16, '35.) 19166.

Chemical and Allied Stocks and Shares

THERE has been a fairly general expansion of activity in the industrial section of the Stock Exchange, due partly to the favourable review of trade prospects contained in the speech of the President of the Board of Trade. Among shares of chemical and kindred companies the tendency was again firm. Imperial Chemical show little change on balance, but a further upward movement in B. Laporte has been shown at the time of writing, there being continued talk in the market of the possibility of a further bonus as time proceeds. Distillers were higher. Although the statements at the meeting were inclined to diminish hopes of a bonus in the more immediate future, the chairman's speech tended to add to the belief that the company probably has considerable scope for expansion, particularly on the chemical side of its activities. A point of interest was further appreciation in Borax Consolidated deferred shares which responded to the disposition in the market to revise dividend estimates upwards and to expect that the resumption of interim dividend payments will be forthcoming in September. A short while ago the market was talking of an increase in the company's dividend to 7½ per cent., but 9 per cent. is now said to be possible. For the previous year the dividend was 5 per cent. and at the meeting the chairman referred to the increasing uses and demand for borax. British Oxygen provided possibly the strongest feature in the industrial market with a further large advance. The demand for the shares is due to expectations that a substantially larger dividend may be in prospect if, as seems likely, the activity in the heavy industries is accelerated, as the latter are, of course, large users of the company's industrial gases and other products. Murex were again higher, largely for a similar reason. British Industrial Plastics were little changed, as were Lawes Chemical and William Blythe, but in the two latter cases prices were not apparently tested by a great deal of business. Triplex Glass were again in demand on anticipations of a larger dividend or a possible bonus. Interest attached in the market to the news that the associated company, Triplex (Northern) has acquired H. E. Ashdown, of Birmingham, a private company which manufactures moulded products, including mouldings for the motor trade. United Premier Oil and Cake were again more active on the belief that trading conditions are running in the company's favour and that a larger dividend seems in prospect. Last year fully 40 per cent. was earned on the shares, but the dividend was limited to 10 per cent. although there was also a 5 per cent. share bonus provided from reserve. International Combustion have been favoured on a more general realisation that, particularly since the initiation of an interim dividend payment, the market is looking for an increase in the total dividend for the year to 25 per cent. Greeff Chemical Holdings 5s. ordinary shares were again steady at around 9s. 3d., while the 5½ per cent. cumulative preference shares (the nominal value of which is 10s.) have made the higher price of 11s. 4½d. The 5½ per cent. preference shares of Monsanto Chemicals came in for more attention in view of the good cover for their dividend requirements. They are quoted at 23s. "middle" and business has been recorded around 23s. 3d. British Glues have again been very steady. Burt, Boulton and Haywood were again unchanged as were Fison, Packard and Prentice. Although there was no change in the interim dividend of the latter company, there are still anticipations in the market that a larger final dividend is likely. A larger capital ranks for the whole of the current financial year, but fuller benefits will probably accrue from the expansion of the business. International Nickel were higher on the expectations attaching to the quarterly dividend. Imperial Smelting were aided by hopes of a satisfactory dividend for the past year and United Molasses were more active. Pinchin, Johnson and other paint shares received more attention. Dorman Long, Staveley, Babcock and Wilcox, Clarke Chapman and many other shares of engineering and allied companies moved up very favourably on the week. Iron and steel shares generally were assisted by the recent news that this country is to remain in the International Steel Cartel, as this should apparently prevent the development of increased competition in export markets. Associated Portland Cement were good and Alpha Cement responded to the higher interim dividend. Leading oil shares were active at higher prices, particularly "Shell," which were bought on the view that the dividend for the current year may be raised to 20 per cent., tax free.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

County Court Judgments

(NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court Judgments against him.)

DOUGLAS, ANTHONY, 66 Southampton Road, N.W.5, manufacturing chemist. (C.C., 25/7/36.) £18 6s. 10d. June 16.

HOLMWOOD, HARRY T., 9 Cerne Road, Morden, chemical worker. (C.C., 25/7/36.) £10 17s. 8d. June 8.

Receivership

T. PILKINGTON AND CO., LTD. (R., 25/7/36.) C. H. Mellor, of 180 Corn Exchange Buildings, Manchester, was appointed receiver and manager on July 9, under powers contained in debentures dated October 12, 1933.

Appointment of Liquidator

THE WINCHESTER CHEMICAL CO., LTD. (C.W.U., 25/7/36.) Mr. J. E. Talbot, 5-11 Theobalds Road, London, W.C.1, appointed liquidator July 3, 1936.

Company Winding-Up

ELECTRO CHEMICAL PROCESSES, LTD. (C.W.U., 25/7/36.) Winding-up Order, July 13.

New Chemical Trade Marks

Compiled from official sources by Gee and Co., patent and trade mark agents, Staple House, 51 and 52 Chancery Lane, London, W.C.2.

Albanite. 560,486. China clay. English Clays Lovering Pochin and Co., Ltd., 14 High Cross Street, St. Austell, Cornwall. May 27.

Craydol. 560,812. Wood preservatives. Dussek Bros. and Co., Ltd., 14 Verney Road, London, S.E.16. May 24.

Pyremist. 560,655. Chemical substances used for agricultural, horticultural, veterinary, and sanitary purposes. Stafford Allen and Sons, Ltd., 7 Cowper Street, Finsbury, London, E.C.2, and Long Melford, Suffolk. June 4, 1935.

Florinat. 555,389. Chemical substances for steeping, colouring and brightening textile fabrics and leather in the course of their manufacture. H. Th. Böhme Aktiengesellschaft, 29 Moritzstrasse, Chemnitz, Saxony, Germany. November 6, 1934. Address for service in the United Kingdom is c/o H. Douglas Elkington, 20 to 23 Holborn, London, E.C.1.

Netazym. 560,757. Chemical substances for steeping, colouring and brightening textile fabrics and leather in the course of their manufacture. Böhme Fettchemie-Gesellschaft Mit Beschränkter Haftung, Moritzstrasse, 25-33 Chemnitz, Saxony, Germany. June 7. Address for service in the United Kingdom is c/o H. Douglas Elkington, 20 to 23 Holborn, London, E.C.1.

Mexo. 559,740. Anti-corrosives. Olof Mellgren, 5a Vasagatan, Göteborg, Sweden. April 25, 1935. Address for service in the United Kingdom is c/o Marks and Clerk, 57 and 58 Lincoln's Inn Fields, London, W.C.2.

Acronal. 552,956. Solutions or emulsions of artificial resin being chemical substances for use as ingredients in manufactures. I. G. Farbenindustrie Aktiengesellschaft, Grüneburgplatz, Frankfurt-on-the-Main 20, Germany. July 30, 1934. Address for service in the United Kingdom is, c/o Albert L. Mond, 19 Southampton Buildings, Chancery Lane, London, W.C.2.

Enprädil. 560,756. Chemical substances for steeping, colouring and brightening textile fabrics and leather in the course of their manufacture. Böhme Fettchemie Gesellschaft Mit Beschränkter Haftung, Moritzstrasse 25-33, Chemnitz, Saxony, Germany. June 7, 1935. Address for service in the United Kingdom is, c/o H. Douglas Elkington, 20 to 23 Holborn, London, E.C.1.

New Companies Registered

H. A. Penney, Ltd., 3-5 Burlington Gardens, W.—Registered July 16. Nominal capital, £10,000 in 9,000 7 per cent. (free of income tax) cumulative preference shares of £1 each; 3,800 ordinary shares of 5s. each, and 1,000 founders' shares of 1s. each. Manufacturers of and dealers in chemicals, gases, drugs, medicines, toilet requisites, etc. Directors: Walter Lewis, H. A. Penney, H. E. Watts.

Hildreth and Co., Ltd., 80 Cambridge Street, Birmingham.—Registered July 13. Nominal capital £1,000 in £1 shares. Manufacturers of and dealers in first-aid requisites, chemicals, gases, drugs and medicines, etc. Directors: Mrs. Ellen M. Hildreth, and E. W. Nichols.

Company News

South Metropolitan Gas Co.—The directors have declared an interim dividend of 2½ per cent. on the ordinary stock for the six months ended June 30 last. Holders of the £6,709,895 ordinary capital received a similar payment in 1935, when the total distribution for the year was 5¼ per cent.

Bowater's Paper Mills, Ltd.—An interim dividend of 4 per cent., less tax, on the ordinary shares in respect of the year ending September 30 next has been declared. No interim has been paid in previous years, the distribution on the £500,000 ordinary capital for 1935 being 5 per cent.

W. and T. Avery, Ltd.—The gross profit touched a new high record at £189,502, and compares with £155,687 in the previous year. After allowing a larger amount—£29,987, against £22,470—for depreciation, and charging directors' fees and remuneration, etc., the net profit comes out £25,514 higher at £149,601. The transfer to general reserve of £37,363 brings this fund to £185,000. In 1934-35, £30,000 was placed to reserve. The ordinary dividend is again 15 per cent., but is paid on a larger capital, as last year shareholders received a capital bonus of 20 per cent. The amount carried forward is £62,352, compared with £60,483 brought in.

Griffiths Hughes Proprietaries.—This company, which owns the capital of E. Griffiths Hughes, manufacturers of Kruschen Salts and other proprietary articles, earned a net profit of £249,627 in the year to June 30 last, after including a tax credit of £1,058. This shows a slight increase on the figure of £246,580 earned in the initial period of July 3, 1934, to June 30, 1935. The distribution on the £1,500,000 ordinary capital is maintained at 17½ per cent., less tax, leaving the carry-forward increased from £518 to £6,770. Profits of the operating company amounted to £456,678 (including £2,737 appreciation of investments) in the year to March 31 last, compared with £462,144. After providing for tax, again placing £90,000 to reserve, and paying dividends amounting to £253,351 (same), the carry-forward is higher at £17,016.

Chemical Bank and Trust Co.—A statement of conditions at June 30 shows assets totalling $635,115,036, comprising cash and due from banks $180,505,074; U.S. Government obligations, direct and fully guaranteed, $156,571,488; bankers' acceptances and demand loans, $79,670,304; eligible paper and short-term notes, $52,546,627; State and municipal bonds, $31,740,502; other bonds and investments, $11,786,748; loans and discounts, $102,484,094; banking houses owned, $192,907; other real estate owned, $6,425,141; mortgages owned, $4,562,526; credits granted on acceptances, $5,362,000; other assets, $3,267,619. Liabilities: Capital stock, $20,000,000; surplus, $40,000,000; undivided profits, $12,685,448; dividend payable July 1, 1936, $900,000; reserved taxes, interest, etc., $8,907,445; acceptances outstanding, $5,599,104; other liabilities, $1,681,490; deposits, $545,341,547; total, $635,115,036.

Benn Brothers, Ltd.—The directors recommend the payment of the following final dividends less tax for the year ended June 30, 1936:—3 per cent. on preference shares, which with the interim dividend of 3 per cent. paid in February makes 6 per cent. for the year; 10 per cent. on ordinary shares, which with the interim dividend of 5 per cent. paid in February makes 15 per cent. for the year; and 2s. per share on the deferred shares, which with the interim dividend of 1s. per share paid in February makes 3s. for the year.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Denmark.—An agent established at Copenhagen wishes to obtain the representation of United Kingdom manufacturers of raw materials for the plant and varnish industry. (Ref. No. 75.)

Switzerland.—An old-established agency firm at Zurich wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of chemicals used in the foodstuffs industry. They would also be prepared, if necessary, to act on a consignment basis. (Ref. No. 76.)

Latest Oil Prices

LONDON, July 22.—LINSEED OIL was slow. Spot, £28 15s. (small quantities), Aug. and Sept.-Dec., £26 2s. 6d.; Jan.-April, £25 17s. 6d., naked. SOYA BEAN OIL was steadier. Oriental (bulk), spot, Rotterdam, £24 5s. RAPE OIL was steady. Crude extracted, £34 10s.; technical refined, £35 10s., naked, ex wharf. COTTON OIL was steady. Egyptian, crude, £27; refined common edible, £30 10s.; deodorised, £32 10s.; naked, ex mill (small lots, £1 10s. extra). TURPENTINE was quiet. American, spot, 39s. 3d. per cwt.

HULL.—LINSEED OIL.—Spot, quoted £27 2s. 6d. per ton; July, £26 12s. 6d.; Aug., £26 10s.; Sept.-Dec., £26 2s. 6d.; Jan.-April, £25 17s. 6d. COTTON OIL.—Egyptian, crude, spot, £27; edible, refined, spot, £29; technical, spot, £29; deodorised, £31, naked. PALM KERNEL OIL.—Crude, f.m.q., spot, £22 10s. GROUNDNUT OIL.—Extracted, spot, £33; deodorised, £36. RAPE OIL.—Extracted, spot, £33 10s.; refined, £34 10s. SOYA OIL.—Extracted, spot, £29 10s.; deodorised, £32 10s. per ton. COD OIL.—F.o.r. or f.a.s., 25s. per cwt. in barrels. CASTOR OIL.—Pharmaceutical, 43s. per cwt. Firsts, 38s.; seconds, 36s. TURPENTINE.—American, spot, 42s. per cwt.